

**U. S. Department of Agriculture
Forest Service
Plumas National Forest**

**State of California
Resources Agency
Department of Water Resources**

**JOINT
ENVIRONMENTAL IMPACT STATEMENT
ENVIRONMENTAL IMPACT REPORT**

**PROTOTYPE PROJECT
TO AUGMENT SNOWPACK BY CLOUDSEEDING
USING GROUND BASED DISPENSERS
IN PLUMAS AND SIERRA COUNTIES**

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ENVIRONMENTAL IMPACT STATEMENT/ENVIRONMENTAL IMPACT REPORT

Plumas National Forest
State of California
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Prototype Project to Augment Snow Pack by Cloud Seeding
Using Ground Based Dispensers

Plumas and Sierra Counties, California

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Abstract: The Department of Water Resources is proposing to conduct a 5-year operational test program for enhancing water yield by augmenting the snow pack by the cloud seeding of winter storms using ground-based dispensers located on mountain tops in the vicinity of the Lakes Basin Area on the Plumas National Forest. The Department of Water Resources facilities supporting this program would be located on both Forest Service and private lands. This document is a cooperative effort between the Forest Service and the Department of Water Resources and complies with both the requirements of the National Environmental Policy Act (NEPA), Federal Regulations 40 CFR 1500-1508, and the Forest Service 1950 Manual, and State CEQA Guidelines.

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I. PURPOSE AND NEED FOR ACTION

A. Introduction

The State Department of Water Resources has the responsibility to help protect, conserve, develop and manage California's water for present and future needs. Paramount in this responsibility is the examination of current water use and supply, and development of plans to meet the water needs of a continually increasing population that has grown from 24 million in 1980 to 30 million in 1990 and is expected to continue growing to 36 million by the year 2010.

Studies have shown that utilization of existing reservoirs and ground water basins for water supply regulation are only sufficient to meet present and foreseeable water needs in about three of four years, based on historical hydrology records. Increased water conservation practices and waste water re-use alone will not make up the deficit. Other measures to increase water supplies will have to be implemented. These include, but not limited to, such actions as extraordinary conservation efforts, purchasing water being used on areas having low economic or less essential use and transferring the water to more productive or essential areas, refilling overdrafted ground water basins during years of plentiful supplies of surface water, and using weather modification (cloud seeding) to increase runoff to existing reservoirs during years when the reservoirs have unused storage space.

This document presents a description of the Department of Water Resources' proposal to implement a detailed five-year study in a limited area of the Feather River drainage to determine if it is possible to augment the water content of the snowpack using cloud seeding and thus increase runoff to Lake Oroville.

The area selected for this study is the Middle Fork of the Feather River drainage from the Sierra Crest on the west to Grizzly Ridge to the east. This area provides the necessary topographic relief to allow proper placement of ground-based liquid propane dispensers within supercooled regions of passing winter storms along with a comparably elevated target area where precipitation measuring equipment along with other scientific instrumentation can be placed to properly evaluate the effects of seeding.

This time-limited study is designed to provide the information needed for a realistic verification of snowpack augmentation by cloud seeding (benefit) and allow comparison to expected operational costs.

The project is to be controlled by seeding suspension criteria that were designed to terminate seeding well before snowpack depths or rainfall amounts exceeded historical limits for which runoff excesses may occur. In addition, these criteria allow discretionary suspension if it is felt that seeding might contribute to any adverse situation within the project area, such as avalanche hazards.

This project is designed as a prototype cloud-seeding endeavor that will consist of: (1) the design and temporary installation of scientific equipment to obtain basic research data in a controlled and scientifically verifiable manner; (2) design, installation, and operation of experimental weather modification equipment; and (3) selection of resource evaluation activities which will assure no major impacts on any environmental resource.

The California Environmental Quality Act permits this type of study to be exempt from the provisions of CEQA as a class 6 categorical exemption as listed in section 15300. This section states that a class 6 exemption consists of basic data collection research, experimental management, and resource evaluation activities, which do not result in a serious or major disturbance to an environmental resource. These may be strictly for information-gathering purposes or as a study leading to an action which a public agency has not yet approved, adopted or funded.

However, the Department, concerned about public concepts on possible weather modification environmental effects, has prepared the document as an EIR.

If evaluation of the information obtained by this project concludes that the levels of snowpack augmentation are sufficient to make a larger project feasible, a decision could be made by the Department to expand the program to other areas of the Middle Fork Feather River drainage. A new environmental assessment and impact report would then have to be made for any proposed expansion. This expanded program is an action which the Department has not yet approved or funded.

Many issues and questions were presented by the public at the four scoping sessions held in February and March of 1988 and base line scoping comments given on the Draft EIS on this limited snowpack augmentation project. Some of the issues and questions raised were beyond the scope of this limited project and are not addressed in the report. Those issues and questions that were within scope have been addressed.

The project area was selected for its accessibility, terrain, elevations, and availability for installation and operation of scientific-measuring instruments for monitoring effects of cloud-seeding efforts. The proposed dispenser sites were selected using criteria that (1) the dispensers be located in the farthest upwind areas that would assure maximum impact from snowpack enhancement in the Lake Oroville watershed, (2) the site be on an exposed ridge with no obstructions to interfere with mixing of seeding agent or the ice crystals created, and (3) that the dispenser locations be above 6,500 feet in elevation.

The areas of potential impact varies for the different possible cloud-seeding agents. Using the above criteria, if liquid propane is used as a seeding agent and released from ground-based, dispenser

site locations, it could impact the winter snowfall from the crest of the Sierra Mountains dividing the Middle Fork Feather and Yuba River drainages to the crest of the Grizzly Ridge, approximately 15 miles downwind. This area is shown in Figure 1 and is identified as the "Project Area".

If silver iodide is used as a seeding agent released from dispensers located at the same sites, it would impact the area between the dispenser sites on the Sierra Crest downwind about 35 miles to the Diamond Mountains that divide the Feather River and Susan River drainages. This area is identified as the "Extended Area" on Figure 1. It is doubtful that the Department would proceed with this proposed study if it was required to use silver iodide as the seeding agent because of this extension of the impact area and other associated factors.

B. Decision Needed

Use permits required by the Plumas National Forest would be issued to the Department of Water Resources for installation of dispensers and monitoring equipment upon approval of the project.

C. Management Direction

The Plumas National Forest Environmental Impact Statement for the Land and Resource Management Plan and the Land and Resource Management Plan of August 1988 describe the existing forest environment, policies, and management direction to each management area of the forest. Alternatives presented are consistent with all policies, goals, and direction set forth in the Land Management Plan.

D. Public Sensing

The original cloud-seeding proposal (Lake Oroville Runoff Enhancement Preliminary Project Outline) included selecting four remote target areas in the Feather River drainage for installation of ground-based generators emitting silver iodide as the seeding agent. This project proposal was first presented for review and comment to a ten-member local citizens committee. In January 1988, the U.S. Forest Service then conducted a series of four scoping sessions for the public in the Sierra and Plumas County communities of Loyalton, Portola, Quincy, and Greenville.

Public comments received in these meetings, and up-to-date site specific meteorological information, prompted DWR to modify the original project and remove one of the remote areas (the Bucks Lake Wilderness Area) as a target for snowpack enhancement. In addition, propane (C_3H_8) is now being considered as an alternate for silver iodide as a seeding agent. The Citizen's Committee was kept informed by meetings and correspondence as to changes and the intent of the Department's cloud-seeding project.

The U.S. Forest Service then held a second series of scoping meetings in the same four communities in February and March of 1988 to permit discussion and to receive input on the modified project.

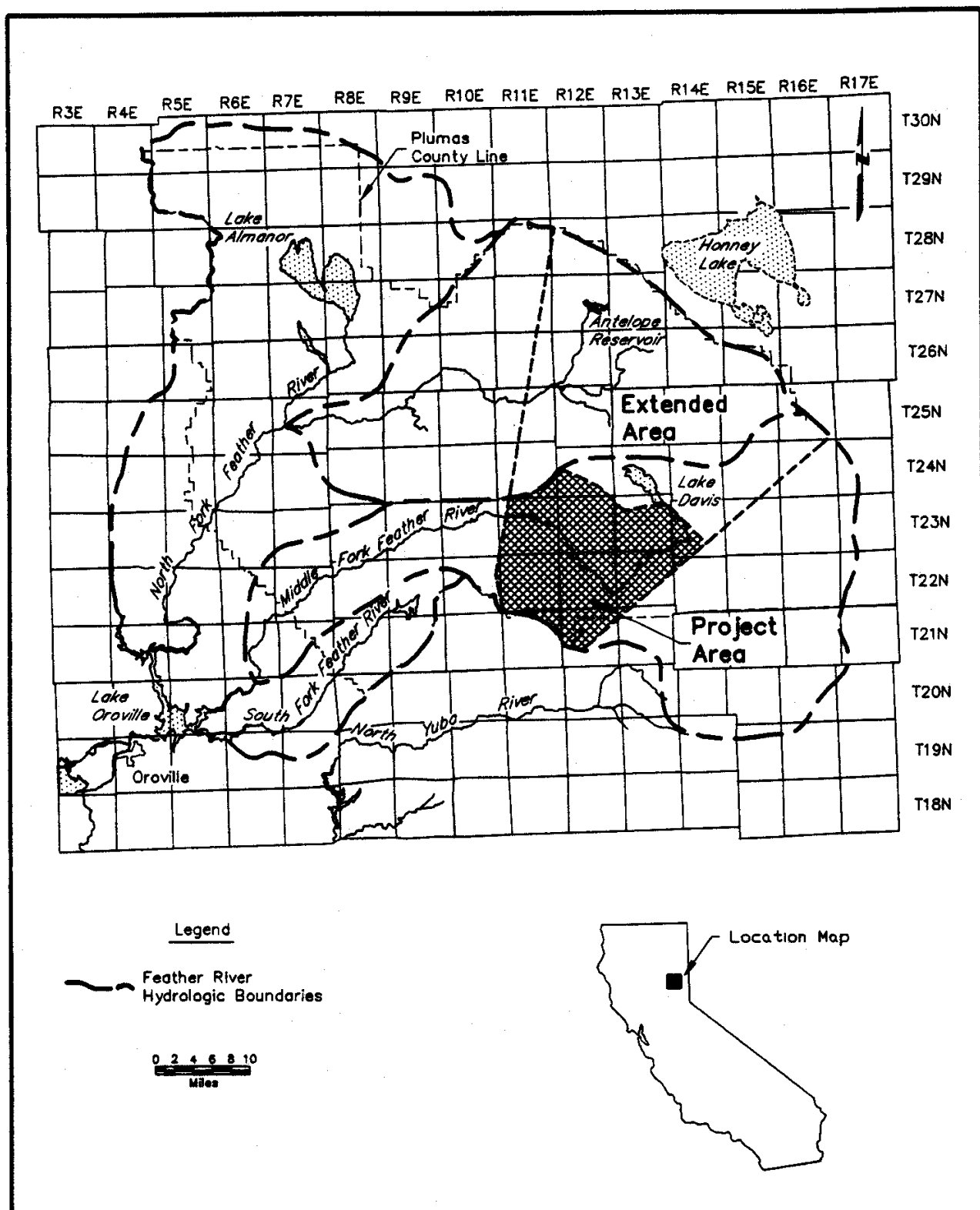


Figure 1. Location of Project and Extended Areas for Snow-Pack Augmentation in Lake Oroville Catchment Area.

Specific comments, by members of the public and concerned groups to the Department's initial study for a proposed Negative Declaration on Lake Oroville Runoff Enhancement Prototype Project, have been addressed in written correspondence by the Department of Water Resources.

E. Issues

Public comments on the Draft EIS/EIR which were received during the 59-day review period (45 regular and 14-day extension) and the Department's responses are presented in Appendix F.

The following significant issues were developed from meetings with the local citizens' committee, oral responses received at scoping sessions, and public letters. The numbers in parenthesis is the page number where the issue is discussed.

1. Climate and Weather

- a. How much additional snowfall will the proposed runoff enhancement prototype project create? (pages 39 and 40)
- b. How long will the additional snowpack extend the snowmelt? (page 46)
- c. Will the extra snowpack affect the climate and lengthen the winter season? (page 46)
- d. What percentage of the precipitation will fall as rain? (page 48)

2. Water Resources

- a. What amount of augmented runoff is expected within the target area? (page 47)
- b. How will the additional snowmelt impact the ground water? (page 47)
- c. Who does the runoff belong to once it enters the stream system? (page 49)
- d. Will the melt from the additional snowpack contribute to or cause flooding? (page 47)
- e. How will the augmented snowpack be affected by winter rains in the target area? (page 47)
- f. How will the additional runoff effect the Wild and Scenic River segment of the Middle Fork of the Feather River and the Nelson Creek Wild Trout Stream Segment? (page 37 and Appendix E)

- g. Will cloud seeding winter storms adversely affect downwind precipitation? (page 50)
- 3. Erosion and Water Quality
 - a. Will snowmelt from the enhanced snowpack cause an increase in erosion or add to existing cumulative impacts? (page 51)
 - b. Will cloud seeding have an adverse impact on existing water quality? (page 53)
- 4. Vegetation
 - a. What will be the effect of weather modification on plant life in the target area? (page 54)
- 5. Wildlife and Fisheries
 - a. How will weather modification affect the Wildlife and Fisheries? (page 57)
- 6. Cultural Resources
 - a. Will snowpack enhancement adversely impact cultural resources? (page 59)
- 7. Aesthetics
 - a. Will the mountain ridge placement of seeding dispensers be visible for great distances or ruin the aesthetic conditions now existing? (page 60)
- 8. Transportation
 - a. Will snowpack enhancement increase the cost of snow removal? (page 61)
- 9. Regulatory
 - a. Is the proposed project in compliance with regulations and planning documents? (page 64)
- 10. Health and Safety
 - a. What are the health risks involved with the proposed seeding agents? (page 40)
 - b. What effects will cloud seeding have on air quality? (page 42)
 - c. What measures will be taken to prevent against explosion or fires in transporting and using propane? (page 62)

F. Opportunities

The need to study potential long-term cumulative effects of weather modification was identified in three resource areas.

1. Development of a weather modification erosion evaluation methodology would be accomplished under Alternatives 1, 2, or 3. Such a methodology could be based on the U.S. Forest Service, Northern Region, Intermountain Region guide for predicting sediment yields from forested watersheds. This effort will be compatible with ongoing U.S. Forest Service efforts to evaluate watersheds on Plumas National Forest lands.
2. A Forest Service directed on-site study of selected plant "taxa" would take place under Alternatives 1, 2, and 3. It is expected that such studies will provide new data on sub-alpine meadows and certain soil moisture sensitive species.
3. Installation of additional streamflow and precipitation gauges will provide additional data for hydrology studies.

II. ALTERNATIVES

Cloud seeding to increase streamflow has been utilized in California for almost 40 years. Though it varies from year to year, there has been as many as 19 cloud-seeding projects in operation in California. A 1985 study of cloud seeding by North American Weather Consultants determined that it is feasible to increase streamflows in the Feather River Basin above Oroville Reservoir, the major source of supply for the State Water Project. Their study concluded that this increase could best be accomplished by seeding cold-winter storms passing over the area, thus adding to the existing snowpack.

In August 1987, the California Department of Water Resources and the U.S. Bureau of Reclamation, Division of Atmospheric Resources Research, entered into a cooperative agreement to conduct a joint investigation into the use of weather modification techniques to augment snowpack and streamflow in the Oroville Reservoir watershed. The agreement specifically deals with the application of research conducted by USBR in the Sierra Nevada and elsewhere to design a cloud-seeding program to increase water supplies available to the State Water Project from the Feather River watershed above Oroville Reservoir. The following alternatives evolved from this collaborative effort.

This section of the assessment has four parts. Part A describes the process used to formulate the alternatives; part B provides a description of alternatives that were considered but eliminated from further detailed study; part C, a description of each alternative; and part D, General Mitigation Measures.

A. Formulating Alternatives

Factors taken into account in the design of a prototype winter snowpack enhancement project were:

1. Suitability of different watersheds for precipitation augmentation
2. Weather patterns
3. Physical characteristics of the project area
4. Existing data bases
5. Ability to determine specific weather conditions on an hour-by-hour basis
6. Seeding agent
7. Method of seeding agent release
8. Availability or practicality of installing data collection systems
9. Assessment of the impacts of cloud seeding on the environment
10. Public comment
11. Cost effectiveness

With these factors and the LMP in mind, alternatives were developed. Four of these alternatives are presented in detail below including a "No Action" alternative.

The precipitation enhancement area associated with Alternatives 1, 2, and 3 was selected for its potential to meet the relevant criteria described under part A "Formulating Alternatives." A detailed description of this area is included under Section III - Affected Environment.

B. Alternatives Considered but Eliminated from Further Study

Three alternatives were considered but eliminated based on major problems with their implementation and/or not meeting the criterion used for formulating alternatives (page 8). The first consisted of the aerial release of CO₂ pellets or silver iodide to target the intended watershed. This was part of the proposed program as outlined by North American Weather Consultants in their feasibility study. Aerial seeding provides the opportunity to directly inject the seeding material into appropriate regions of storms that may not be reachable by ground-based delivery systems. In considering this alternative, there were several practical drawbacks: mechanical breakdown of aircraft (seeding a substantial volume of clouds would

require multiple aircraft) and severe airframe icing would both increase the cost of the project as well as restrict hours of operation. Additional manpower and equipment to monitor aircraft position and avoid severe convective storms, would also increase cost. Targeting of the seeding effects is difficult (aircraft seeding produces longer particle trajectories and therefore causes greater uncertainty in targeting accuracy). Because of these limitations, detailed study of this alternative was not considered further. It should be mentioned that the Department did pursue an aerial-seeding program in the 1988-89 winter, but only for drought alleviation purposes. Aerial seeding is not now being considered as a viable long-term seeding method for increasing the firm yield of Oroville Reservoir.

A second alternative was to seed the Bucks Lake region above the 5,000-foot elevation using remote, ground-based, silver iodide generators. A series of public meetings was held on this alternative. Weather information was collected in this area to determine the feasibility of ground-released material reaching levels where activation would take place soon enough for the augmented precipitation to target the proper locations. Public concerns were strongly against seeding a wilderness area, and no practical means to monitor seeding effects were available under access restrictions imposed in the wilderness. It was also determined that only about 20 percent of the storms could be effectively treated with silver iodide given the warm temperatures in this location and the shallow barrier upwind of this target area. The low elevations upwind of this target also make it impractical to seed with other seeding agents requiring direct injection into supercooled cloud, such as solid CO₂ or liquid propane. Observations made by remote icing rate meters situated at the mountain top indicate that dispensers would need to be above 6,500 feet elevation before substantial icing occurrences exist to make seeding practical. No terrain at or above this elevation exists upwind (southwest of the Bucks Lake area); therefore, this alternate target area was eliminated from further evaluation.

A third alternative was that other seeding agents besides liquid propane and silver iodide be investigated for ground release. Two other chemicals were considered to be used as seeding agents. These were liquid CO₂ and liquid N. In order to be released from remote stations at the surface, they must be stored in a heavy, thick-walled tank under high pressure. This would require an air compressor operated by a propane fueled motor and make their use impractical.

Another seeding agent considered was dead "pseudomonas syringae", a bacteria that is receiving notoriety in creating snow for ski resorts. Not enough is known about its safe use, methods of transferring the bacteria to the storm clouds, or its availability to pursue its use at this time. Therefore, they were not pursued as alternate seeding agents.

C. Alternatives Considered

Four alternatives have been analyzed and considered including "no project". All except Alternative 4 (no project) are based on dispersing the seeding agent from ground-based dispensers.

1. Alternative 1 - Ten Surface Located dispensers Using Silver Iodide (AgI) Seeding Agent

The feasibility study by North American Weather Consultants was used as a basis for determination of the augmentation potential in the Feather River Basin. Results were obtained from Pacific Gas and Electric Company's Lake Almanor ground based, cloud-seeding program that has been conducted since 1952. The PG&E program uses silver iodide released from ground-based generators. Results show increases in precipitation at statistically significant levels for storms with the -5°C temperature level below 2895 m (9,500 feet) with the highest percentage increases coming with the -5°C temperature level below 2,286 m (7,500 feet).

Silver iodide (AgI) only becomes effective at producing ice crystals at temperatures colder than -5°C . It has been shown from physical measurements (Reynolds, et al, 1989) that silver iodide released from the ground within complex terrain usually only reaches altitudes of 3,000 feet above the generators in adequate concentrations to produce a sufficient number of ice crystals. Since all of PG&E's generators are between 5,500 feet and 7,000 feet, positive results come with the -5°C level in the range of 3,000 feet above the generators.

This alternative would mimic the PG&E seeding operations by placing ground-based, remote controlled AgI seeding generators at elevations above 6,000 feet to the south and west of the target area. In considering this alternative, however, several factors had to be considered. These include:

- a. Threshold activation temperature for ice crystal production is -5°C or colder.
- b. AgI is known to pool or collect in valleys surrounding the generators and may stay at concentrations sufficient to seed clouds one-to-three days after being released.
- c. The area that may be affected by treatment with silver iodide may extend 50-to-100 miles downwind of the generator locations, depending on cloud conditions downwind.
- d. AgI generators are relatively complex, costly, and not highly reliable when operated remotely.
- e. Materials require special handling and storage and are expensive compared to other seeding agents.

- f. Public concerns over AgI require careful consideration before the wide-spread use of AgI is attempted.

Based on recent observations made in the target area and from historical data, AgI would only be effective on about 20 percent of the storms which pass through the target area. This is assuming that PG&E criteria are followed in conducting the operations. A minimum of ten dispensers would be required for this project. All would be placed on or near the Sierra Crest as shown in Figure 2. Detailed locations and descriptions are included in Appendix A.

A generator site would consist of a 20-by-20-foot concrete pad on which a permanent tower would be placed that reaches approximately 20 feet in height. The dispenser's burners and electronics system would be mounted on the tower. A solution tank containing a mixture of 100 gallons of acetone (CH_3COCH_3) and silver iodide (AgI) and a 100-gallon tank of propane would also be placed on the pad. The propane is used to combust the acetone-silver iodide mixture. The burner produces a 6- to 12-inch flame from 3 orifices when operating (see Figure 3). Initially and each fall, the equipment will be placed by helicopter. All will be removed each spring, except the tower. Leaving the tower in place permanently will violate the guidelines for retention of visual quality objectives.

Placing and removing the equipment will be staged from the Plumas-Eureka State Park ski area parking lot. Propane tanks will be transported empty and filled at the staging area.

The acetone and silver iodide mixture will be formulated and placed in special containers at the supplying refinery and then transported to the site by truck.

Upon removal, the empty propane tanks will be stored in an approved safety area and the silver-iodide containers will be returned to the supplying refinery. All State and Federal regulations would be followed when transporting propane. As the staging site is west of Johnsville, the flight path for the helicopters will be over the uninhabited area to the west and then south to the dispenser sites. Figure 4 shows the anticipated flight tracks to be used for this work.

Communications with each site for remote operation would be by radio on pre-approved FCC licensed frequencies. Control would be from the Department's Sacramento Projects Operation Center.

For proper operation and evaluation, several monitoring devices would be needed both for conducting seeding as well as evaluating the effects of the seeding. Three remote weather stations would be installed on mountain tops in the vicinity of the target area. The locations for these stations are on Red Hill, Mount Hough, and Mills Peak (see Figure 5). Data will be telemetered

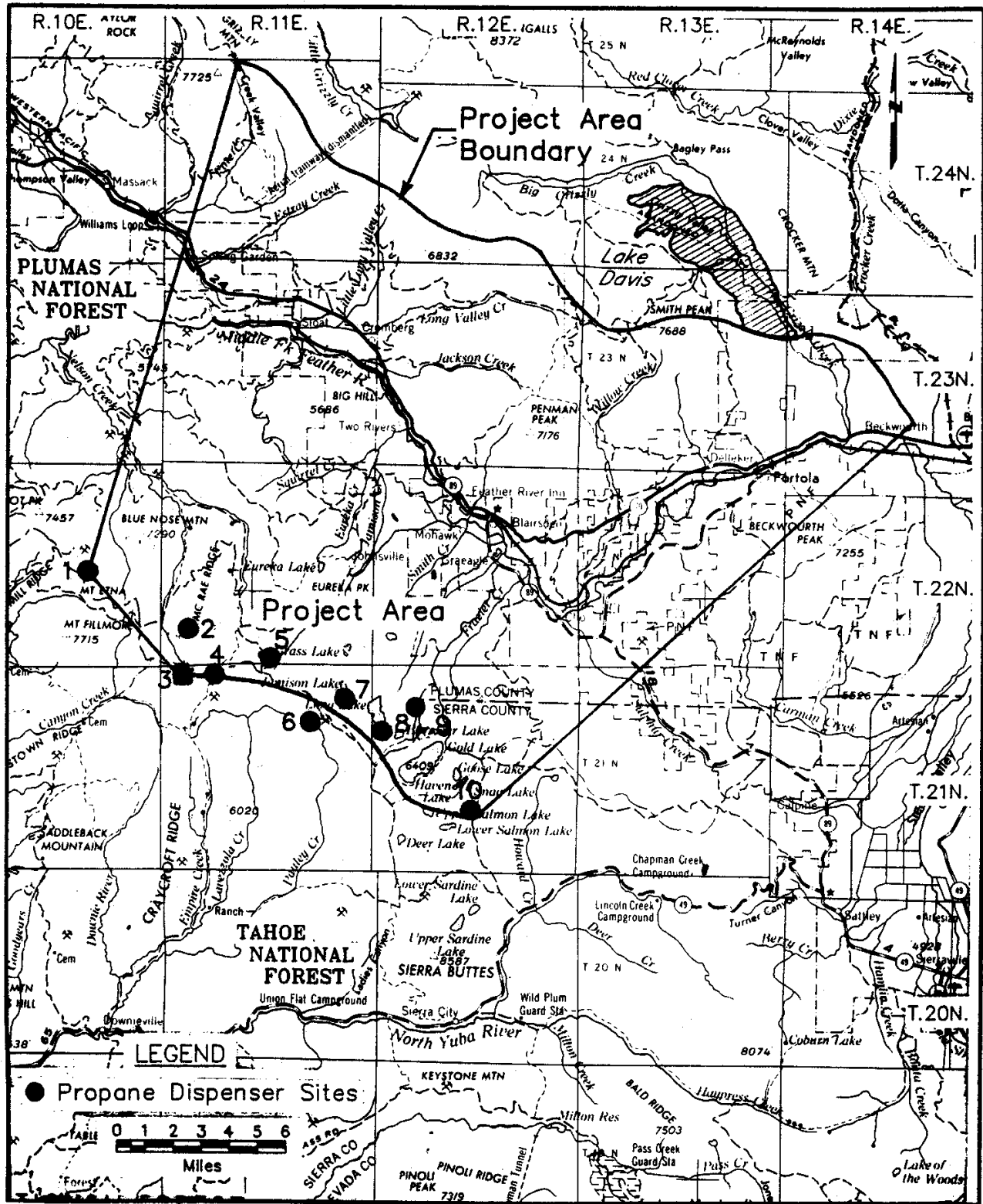


Figure 2. Approximate Propane Dispenser Location And Projected Snow-Pack Augmentation Impact Area.

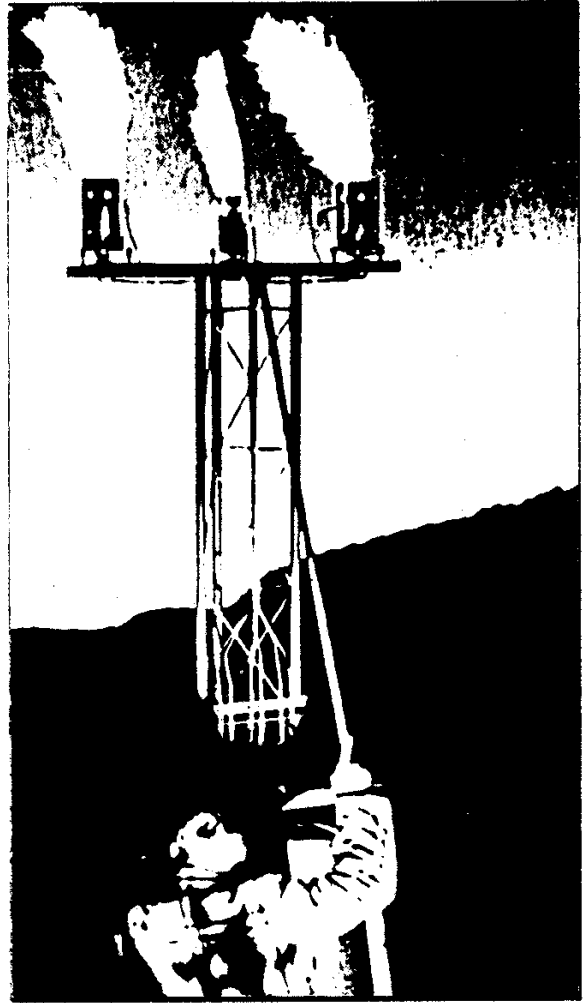
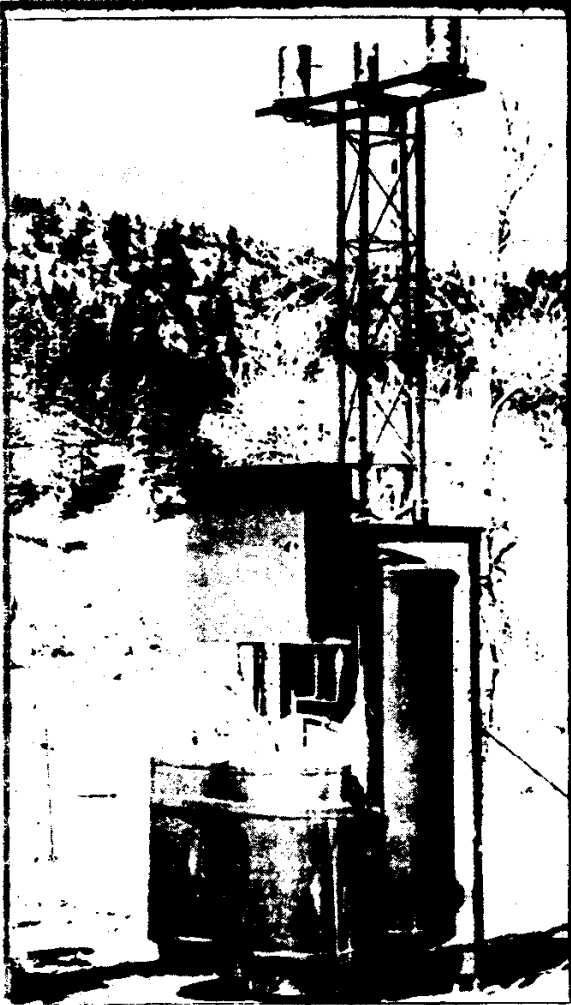


Figure 3. Ground-Based Silver Iodide Generator In Operation.

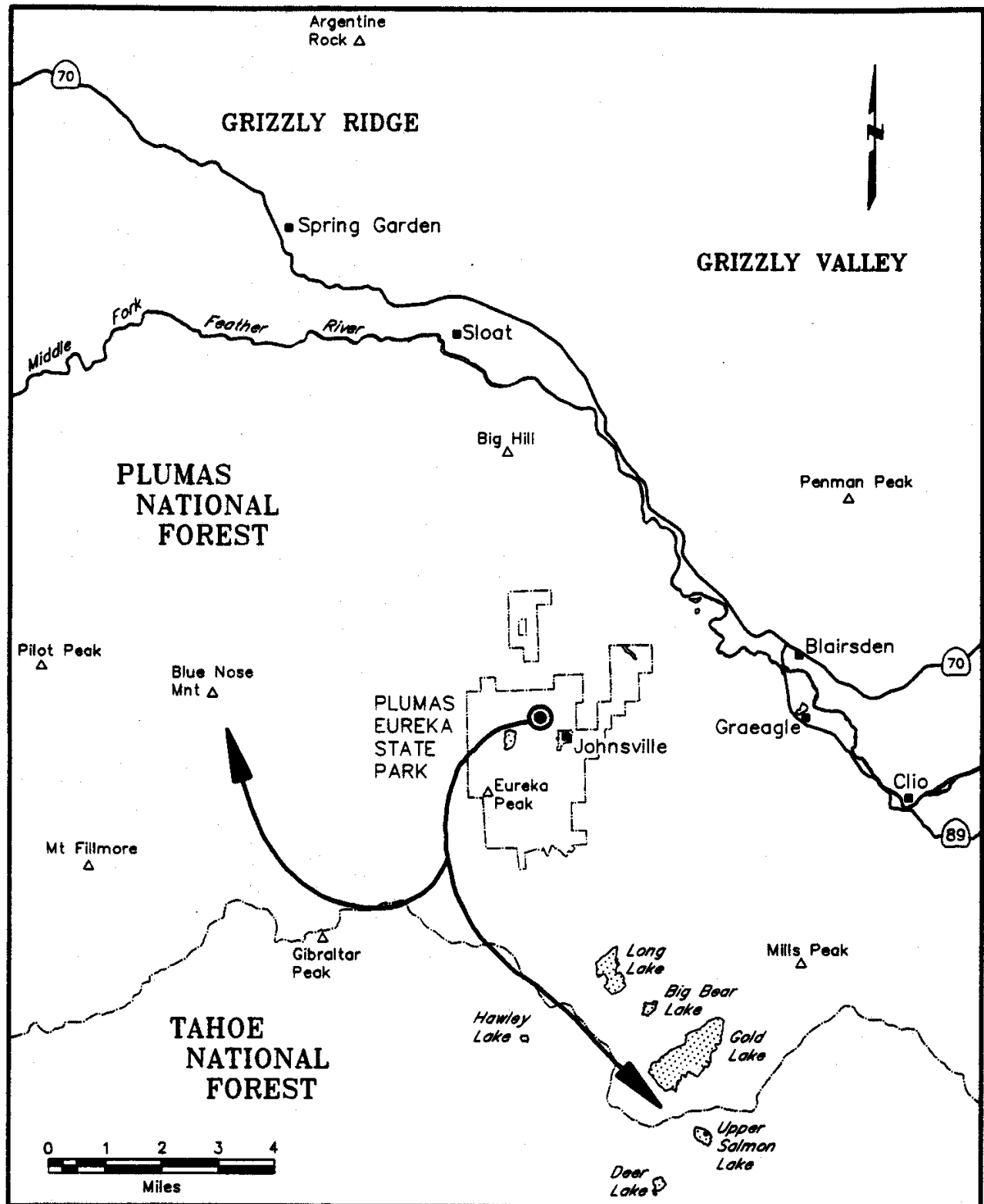


Figure 4. Flight path for Moving Propane Tanks From Staging Area to Dispenser Sites

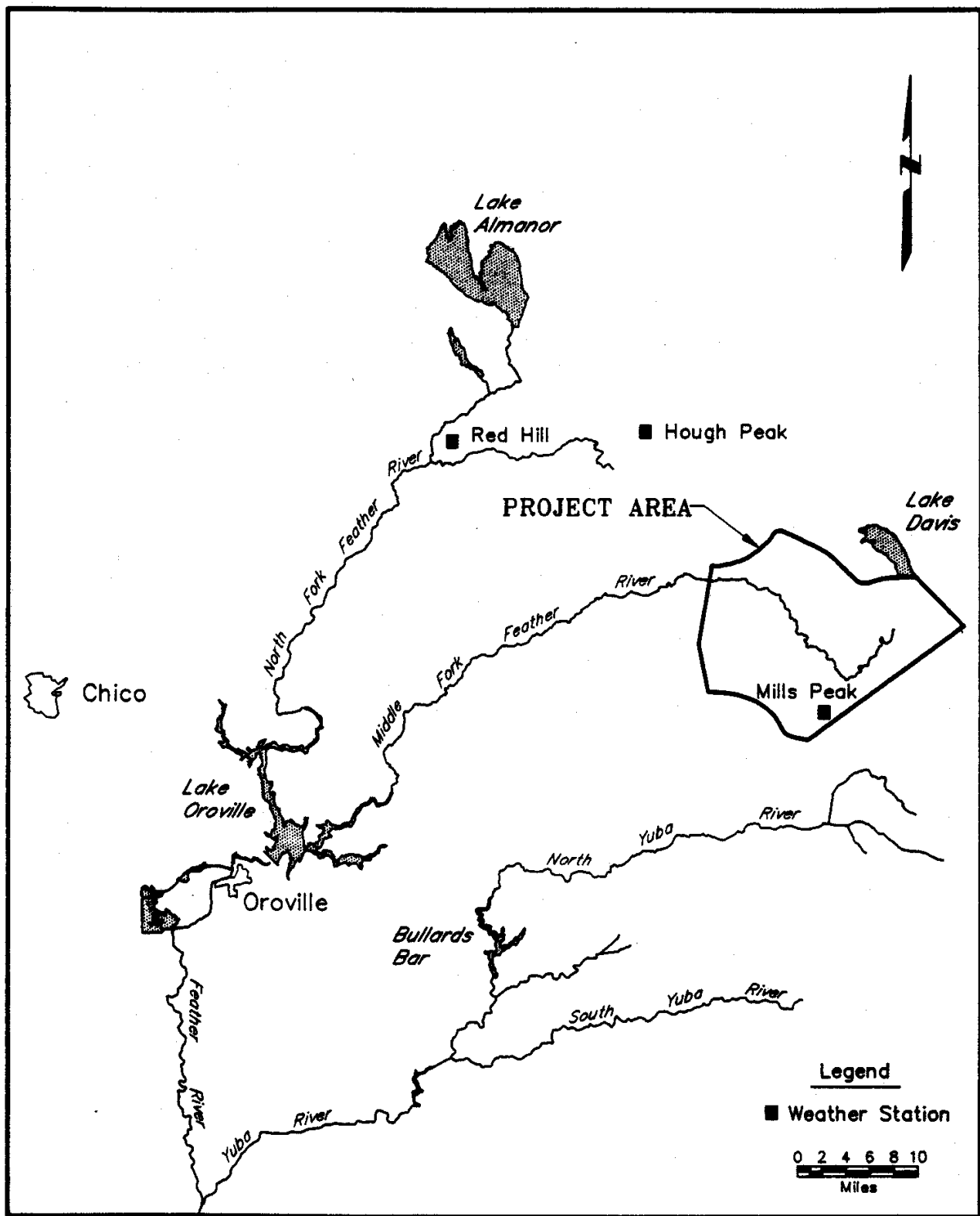


Figure 5. Mountain Top Weather and Icing Station Locations.

through the GOES satellite back to a computer in Sacramento. The presence of liquid water as detected by an icing meter at each of these stations will indicate potential opportunities for treatment.

An extensive precipitation network over an exceedingly large area would be needed to determine the exact extent of the effects of AgI seeding. This would require 20 to 40 automatic precipitation gauges each mounted on a stand-pipe which is cemented into the ground (see Figure 6) that will also telemeter the precipitation data back to a computer in Sacramento through the GOES satellite. Additional data collection would be required before the additional gauge sites could be selected.

To provide real-time information on where the effects of seeding is occurring, two upper-air "rawinsonde" sites would be utilized. One at Johnsville and one at Butte College near Chico, CA. The storms vertical profile of wind and temperature would be measured by balloon carried instruments from these two sites at six-hour intervals. This information would then be input to a numerical model that would predict the fallout locations of the artificial ice crystals produced by the seeding. This information would help determine which, if any, of the dispensers should be activated during treatment.

A monitoring component of this alternative would be a ground microphysics laboratory established within the target area on Grizzly Ridge. This laboratory contains a lazer probe for counting and sizing ice crystals and a microscope for photographing ice crystals collected in a frozen petri dish. The laboratory would be powered by a portable generator. Access to the site in winter would be by snowmobile. The equipment would be located above the 5,000-foot elevation to assure snow would be sampled most of the time. The use of AgI as a seeding agent would permit about 100 hours of seeding based on historic storm temperatures.

2. Alternative 2 - Ten Surface Located Dispensers Using Propane (C₃H₈) as the Seeding Agent

This alternative would seed a portion of the Upper Feather Basin (approximately 165,000 acres) using a network of ground-based, remotely operated liquid propane dispensers. Propane is a freezing agent when it vaporizes after being released as a liquid. It cools the air in the vicinity of a few inches from the release point to below -40° C. At these temperatures, water vapor immediately condenses and forms tiny ice crystals which will grow to snowflakes if additional supercooled liquid water is available. To assure this, the dispensers need to be placed at elevations within wintertime clouds that are at temperatures below freezing. Therefore, for this alternative dispensers will be positioned at altitudes within the range of supercooled clouds at locations allowing rapid dispersion of the

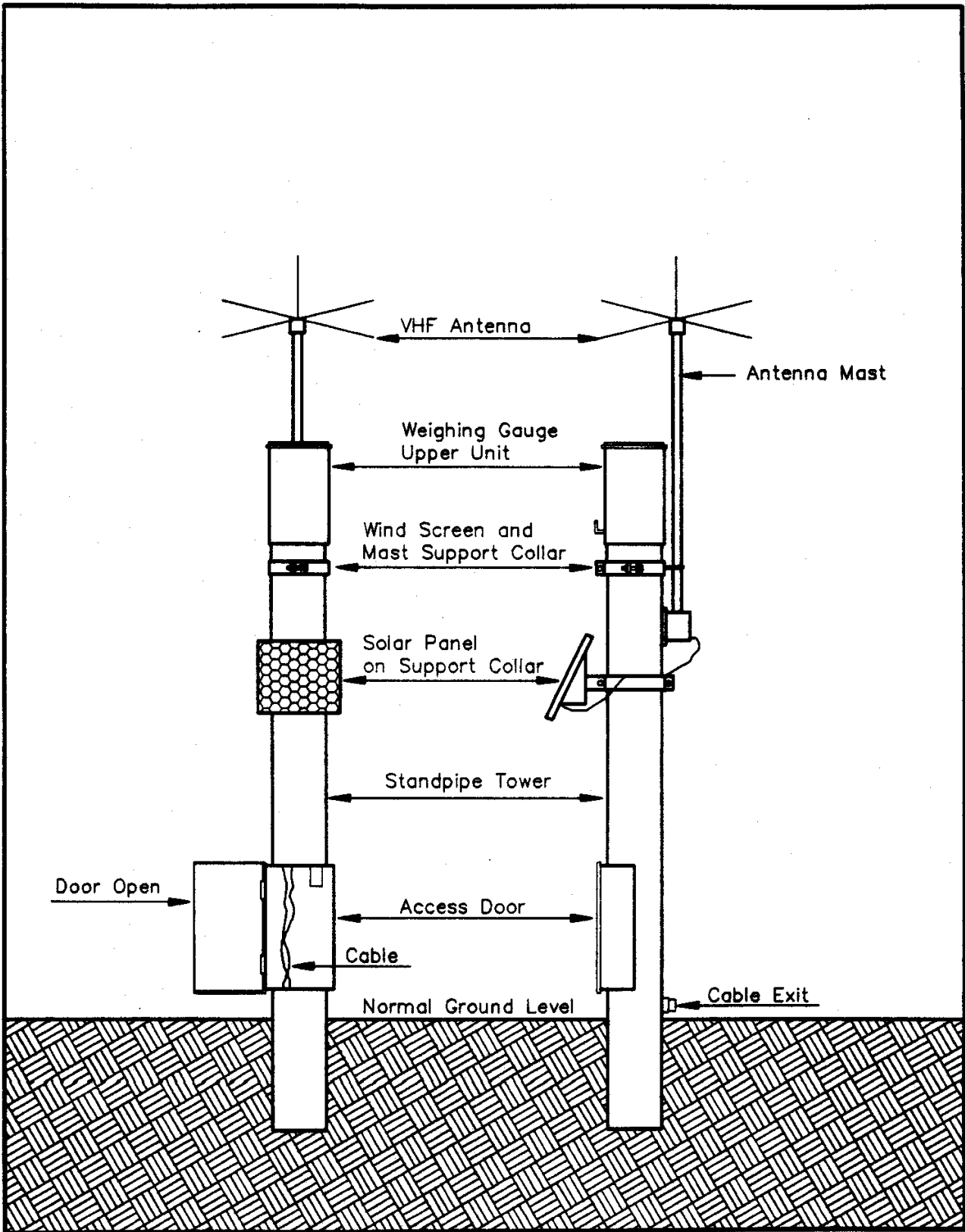


Figure 6. Sketch of Total Precipitation Weighing Gauge.

ice crystals produced. Vardiman et al. (1971) and Hicks and Vali (1973) have documented the use of propane as an effective seeding agent.

It has been determined that temperatures of the Sierra Nevada winter storms moving through this drainage are fairly mild, and the supercooled liquid water that occurs in these storms is often at temperatures just below freezing. The release of liquid propane as a seeding agent provides distinct advantages in this environment. These are listed below:

- a. Water droplets in clouds at temperatures near freezing can be converted to ice crystals in the presence of vaporizing liquid propane.
- b. Since all production of ice crystals is limited to within a few inches of the release point the areal extent of the seeding effects will be concentrated within a region from slightly downwind of the dispensers to possibly 20 miles downwind given the right wind and temperatures.
- c. As direct injection of the liquid propane is required for this technique to work, uncertainties about whether seeding material actually entered clouds at the right times and concentrations are removed.
- d. Remotely operated liquid propane dispensers are easier to design and more reliable to operate than silver iodide dispensers.

Installation and removal of all dispenser equipment would be staged out of the Johnsville ski area parking lot. Propane tanks would be delivered empty to the lot and filled at this site by a propane delivery truck. In the spring, the tanks would be returned to the lot empty and stored in a pre-approved area. USFS and all other State and federal regulations would be followed when transporting propane. As the staging site is west of Johnsville, the flight path for the helicopters will be over the remote uninhabited area to the west and then south to the dispenser sites. The anticipated flight tracks to be used for this work is shown in Figure 4.

Communications with each site for remote operation would be by radio on pre-approved FCC licensed frequencies. Control would be from the Department's Sacramento Projects Operation Center.

For proper operation and evaluation, several monitoring devices would be needed both for conducting seeding as well as evaluating the effects of the seeding. Three remote weather stations would be installed on mountain tops in the vicinity of the target area. The locations for these stations are Red Hill, Mount Hough, and Mills Peak (see Figure 5). Data will be telemetered through the GOES satellite back to a computer in Sacramento. The

presence of liquid water as detected by an icing meter at each of these stations will indicate potential opportunities for treatment.

Initially, nine precipitation gauges will be installed in the project area to help evaluate the effects of the seeding. Approximate locations are shown in Figure 7. Exact location descriptions are included in Appendix B.

These precipitation gauges will be essentially the same as shown in Figure 6, but the standpipe will not be buried in the ground as it would be for permanent installation. Instead, a wide metal foot-plate will be welded on the bottom of the pipe; the foot-plate will then be placed directly on the ground surface and the standpipe will be held in place by guy-wires. This will permit easy installation in October and removal each May.

Communications, placement of all precipitation gauges and dispensers would be as described under Alternative 1. Additional gauges may be needed or gauge locations could be changed to more effectively monitor the cloud-seeding efforts as the study progresses.

It is anticipated that more than 300 hours of storms could be seeded with liquid propane during the winter season. Based on an expected liquid propane release rate of 3 gal/hr., 1,000 gallons of propane will be needed per site. The same 10 dispenser sites selected along the Sierra Crest for Alternative 1 are also the ones selected for Alternative 2 (Figure 2 and Appendix A) and allow for reliable targeting of ice crystals produced. The 10 dispensers will provide adequate coverage to allow proper evaluation in the downstream target area.

To provide real-time information on where the effects of seeding is occurring, weather balloons would be released from two sites, one at Johnsville and the other at Butte College near Chico, California. The storms vertical profile of wind and temperature would be measured by balloon carried instruments from these two sites at six-hour intervals. This information would then be input to a numerical model that would predict the fallout locations of the artificial ice crystals produced by the seeding. This information would help determine which, if any, of the dispensers should be activated during treatment.

A monitoring component of this alternative would be a ground microphysics laboratory established within the target area. This laboratory contains a lazer probe for counting and sizing ice crystals and a microscope for photographing ice crystals collected in a frozen petri dish. The laboratory would be powered by a portable generator. Access to the site in winter would be by snowmobile. The equipment would be located above the 5,000-foot elevation to assure snow would be sampled most of the time.

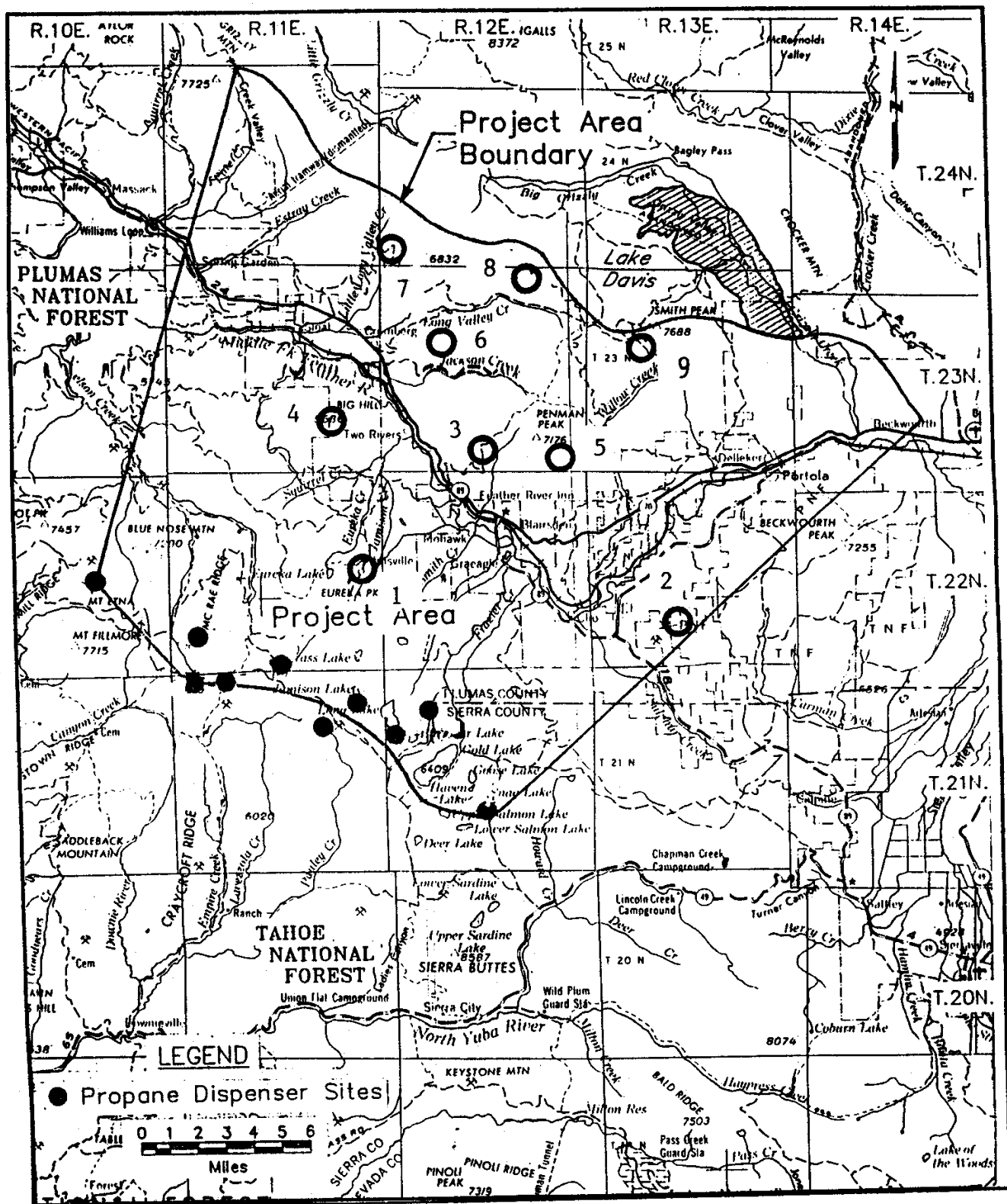


Figure 7. Approximate Precipitation Gauge Locations

The dispenser site set up for this alternative is slightly modified from those described for Alternative 1. There would be no concrete permanent structure, but each dispenser would consist of a tower extending up to 15 feet in the air and have the spray nozzles, the solar panels, the radio control communications box attached to it (see Figure 8). It would be held in place by guy-wires attached to eye-bolts drilled into rocks in the vicinity. Two 600-gallon propane tanks would be located adjacent to the nozzle tower and connected to supply propane at a rate of 3 gallons per hour. It is necessary to locate the dispensers on exposed outcrops to assure proper exposure to wind and icing so the tiny ice crystals produced are not scavenged on downwind trees.

During the 1988-89 and 1989-90 winter seasons, propane dispensers which will be used with this alternative were designed, fabricated, and successfully tested. These dispensers were tested in remote locations on private property near the Sierra crest in Sierra County. They were designed to function in the harsh, winter climate unattended for long periods of time. Each dispenser is radio controlled and capable of accurately releasing propane at the low rates of 2-1/2 to 3 gallons per hour.

Installation and removal of all equipment and propane tanks will be by helicopter and will be staged from the Plumas-Eureka State Park ski area parking lot. All equipment, tower, and tanks will be removed each spring and stored in a designated area until needed the following winter season as per Alternative 1.

3. Alternative 3 - One to Three Surface Located Dispensers Using Propane (C₃H₈) as the Seeding Agent

A smaller project would simply consist of one-to-three seeding dispensers placed at high elevations to the southwest of a very limited target area in the Upper Feather Basin (see DWR, 1989, Negative Declaration for Test Evaluation of Propane Dispensing Units). This alternative would effectively relocate existing dispenser sites presently located on private property (where limited testing has already been conducted) to a subset of ten more suitable sites proposed in Alternatives 1 and 2 on Forest Service lands.

Communications, weather stations, staging, and transportation of equipment and tanks would be as under Alternative 2. However, there would be no need for precipitation gauges or a microphysics laboratory.

This alternative would allow for testing of various dispenser performance characteristics and communication characteristics during storms, but would provide inadequate cloud volume treated to assess impacts on snow enhancement potential. This is due to the very limited cloud volume treated from a limited dispenser array.

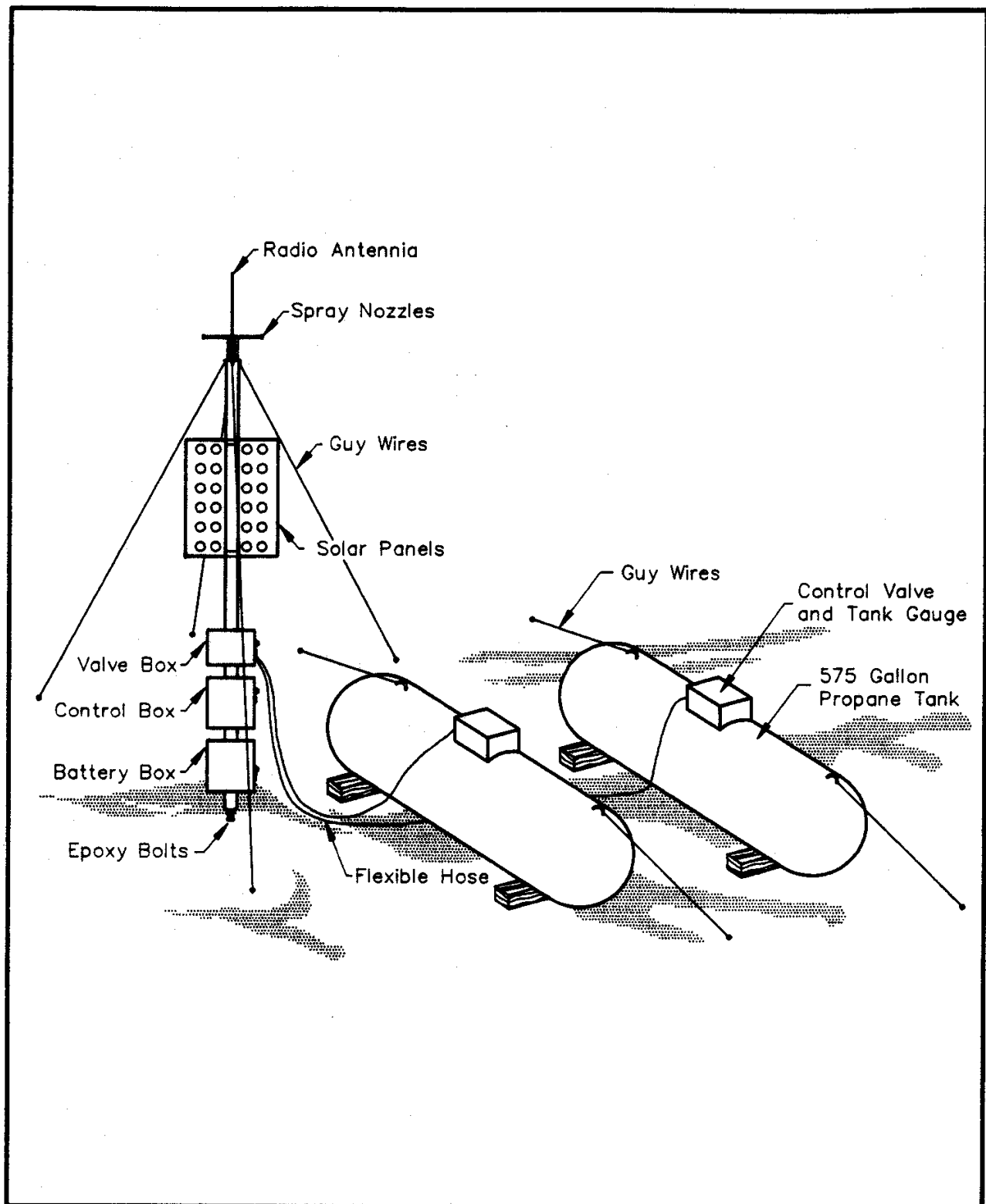


Figure 8. Sketch of Propane Seeding Dispenser Design and Site Set-Up.

The cost of such a program would be proportionately reduced, but so would the output of knowledge on cloud-seeding effectiveness in the Middle Fork Feather River drainage. Such a project would only need to run one or two seasons to accomplish as much as a project such as this could.

Under this alternative, there would be no opportunities for studies of snowpack enhancement, runoff, erosion or the long-term impact of snowpack enhancement on plant species sensitive to variation in soil moisture.

4. Alternative 4 - No Project

In the short term, the decision not to proceed with a prototype project would result in no environmental impact. However, it would also eliminate the possibility of obtaining important information on the suitability of cloud seeding as a viable mechanism to augment water supplies.

Runoff from the Plumas National Forest is the major contributor to the Oroville Reservoir. The demand for water may exceed the total supply by the year 2000. This will require alternative methods of supply or storage or strict water conservation. Also, building sites for structural storage of water are limited and, if reservoir storage was desired, expensive and probably environmentally sensitive regions would be impacted. Recurring drought in the State will have detrimental effects both for the State Water Project and for the target area. Increased disease in forest stands and diminished ground water and domestic water supplies are just a few of the problems that occur during extended dry periods. Not having a viable cloud-seeding program will not help hasten drought recovery by more rapidly returning precipitation to normal levels as storms return.

This alternative precludes the use of any type of ground-based, snow augmentation generators and provides a baseline for comparing the environmental effects of the other alternatives considered in this document.

D. General Mitigation Measures

The following general mitigation measures, which are common to all alternatives except number four, (no action) were developed based on environmental analysis of the alternatives, Forest Service requirements and from public input. Each mitigation measure briefly discusses its effectiveness in reducing an potential adverse impact. Mitigation measures which apply to specific alternatives will also be outlined here.

1. Cultural Resources Vegetation

To determine site adequacy, the dispenser and precipitation gauge sites have been surveyed by a Forest Service approved archaeologist and plant specialists to assure no impact on cultural resources nor impact on rare or endangered plant species. Each site is delineated large enough in area to permit some flexibility for dispenser or gauge location. The final locations will be identified with permanent markers to ensure exact placement of the tanks on the approved locations during later years.

a. Effectiveness

During site preparation, on-site presence of a qualified archaeologist and plant specialist should eliminate any possibility of disturbing undetected archaeological resources or rare plants even though thorough site inspections have been made prior to installation.

2. Soils

During site preparation activities, access to each site would be by a four-wheel-drive vehicle on existing roads. Where roads terminate prior to the site, access would be made on foot or by helicopter. Alternative 1 would require 4 holes dug 24 inches deep for the tower footings. Concrete would be mixed at the site. Excess dirt from the hole would be scattered at the site. Alternatives 2 and 3 would require bolts and guy wire tie-downs placed in rock. No pads would be used for Alternatives 2 and 3. Installation of dispensers and propane tanks would be by helicopter in the fall and removed the same way in early spring. Personnel will also be transported by helicopter for this activity as needed. Winter access will be by over-snow vehicle.

a. Effectiveness

By driving on existing Forest Service roads, using helicopter or over-snow vehicles for site access, soil disturbance will be minimal. Site installation design is such as to minimize soil disturbance.

3. Esthetics

Most site locations are situated in remote areas away from winter use access areas. Care will be given to actual placement of the pad and equipment to make them less visible from the Pacific Crest Trail and minimize the impact on the esthetics of the area. All equipment will be painted white to blend in with the snow background; however, the guy wires will be covered with orange-colored PVC pipes to warn people against straying into them.

a. Effectiveness

Propane dispensers would be in place during periods of low recreational use minimizing potential contact with recreationists. Dispenser sites would be difficult to locate without specific directions.

4. Public Safety

A potential hazard to public safety will be in transporting the filled propane tanks to the sites. By using an approved Forest Service Fire Plan and by transporting the filled tanks over terrain away from any populated regions, public safety will not be jeopardized.

a. Effectiveness

Standard practices for safely transporting propane and acetone have been developed by the industries producing them. These practices have been approved as being effective in minimizing impacts on public safety and will be employed on this project.

5. Flooding and Avalanche Danger

All cloud seeding proposed will be suspended when one of the following criteria are met.

Excess Snowpack Water Equivalent. When the water content of the snowpack in the Feather River basin, as measured at 25 identified snow courses in the basin (see Table 1), exceeds the average of the total April 1 historic amounts by the following percentages:

January 1 - 110 percent of snowpack water equivalent
February 1 - 130 percent of snowpack water equivalent
March 1 - 150 percent of snowpack water equivalent
April 1 - 160 percent of snowpack water equivalent

Rain-Induced Winter Floods. Cloud-seeding would be suspended when quantitative precipitation forecasts issued by the National Weather Service indicate the potential for excessive runoff in the project area or downstream areas, as determined by the Flood Forecasting staff of the Department of Water Resources.

These include:

- a. Whenever precipitation (rain or snow water equivalent) at Quincy is predicted or observed to exceed 4 inches in 24 hours, 5 inches in 48 hours, or 6 inches in 72 hours; or for back-up, the gauge amount at Laporte is observed or predicted to exceed 5 inches in 24 hours, 6 inches in 48 hours, or 7 inches in 72 hours.

TABLE 1

HISTORICAL AVERAGE OF
APRIL 1 WATER CONTENT FOR
FEATHER RIVER BASIN SNOW COURSES

<u>Elevation</u>	<u>Name</u>	<u>Number</u>	<u>April 1 Average*</u> (inches)	<u>Measure Dates**</u>
8250	Lower Lassen Peak	47	83.3	1, 2, 3, 4, 5
7300	Kettle Rock	361	25.0	1, 2, 3, 4, 5
7100	Mount Dyer 1	48	26.6	1, 2, 3, 4, 5
6900	Grizzly	359	31.8	1, 2, 3, 4, 5
6800	Eureka Bowl	279	44.3	2, 3, 4, 5
6800	Pilot Peak	388	49.7	1, 2, 3, 4, 5
6700	Yuba Pass	74	31.0	2, 3, 4, 5
6700	Church Meadows	75	32.4	1, 2, 3, 4, 5
6700	Mount Hough	360	31.8	1, 2, 3, 4, 5
6700	Rowland Creek	280	17.9	1, 2, 3, 4, 5
6250	Three Lakes	53	40.9	1, 2, 3, 4, 5
6200	Eureka Lake	52	33.1	2, 3, 4, 5
6200	Harkness Flat	51	29.9	1, 2, 3, 4, 5
6200	Sunnyside Meadow	390	56.0	1, 2, 3, 4, 5
6050	Mount Dyer 2	290	17.2	1, 2, 3, 4, 5
5900	Mill Creek Flat	54	39.7	1, 2, 3, 4, 5
5650	Abbey	355	9.8	1, 2, 3, 4, 5
5600	Letterbox	49	50.4	1, 2, 3, 4, 5
5600	Mount Stover	55	17.1	1, 2, 3, 4, 5
5400	Browns Camp	56	24.5	1, 2, 3, 4, 5
5400	Feather River Meadows	58	23.1	1, 2, 3, 4, 5
5400	Gibsonville	277	30.9	2, 3, 4, 5
5100	Warner Creek	59	16.5	1, 2, 3, 4, 5
4850	Humbug Summit	60	11.7	1, 2, 3, 4, 5
4600	Chester Flat	61	7.4	1, 2, 3, 4, 5
	Average		31.3	

*Based on Hannaford's Feather River model work.

**For example, 1 means near January 1; 2 means near February 1, etc.

- b. Whenever an inflow of 60,000 cubic feet per second or more to Oroville Reservoir.
- c. Whenever Oroville Reservoir is encroached into flood control space and significant releases are being made at Oroville Dam (normally combined releases through the powerplant and spillway in excess of 20,000 cfs).
- d. Whenever floodflows or stages are occurring, or forecast to occur, which exceed flood-warning stages on the Feather River below Oroville.
- e. Whenever the National Weather Service has issued a flash-flood warning for the project area or the DWR Project Director perceives conditions so hazardous as to warrant suspension of cloud seeding. This may include the issuance of avalanche warnings within the project area.

a. Effectiveness

Potential flooding and avalanche hazards are minimized by two key factors. First, the project is designed to operate only in years of average or below average precipitation. The main objective will be to add snowpack during average and dry years. Second, project operations will be suspended based on excess snowpack water-equivalent conditions, potential project area or downstream flooding hazard, severe weather, availability of storage at Oroville Reservoir, or avalanche warnings in the project area.

6. Air Quality

Alternatives 1, 2, and 3 will require dispensing hydrocarbons into the environment. Alternative 1 will also release AgI as well as combustion products from the burning of propane and other hydrocarbons. The concentration of the silver and iodide constituents are well below standards set by the Department of Public Health. Photochemical reactions with the hydrocarbons to form oxides of nitrogen and ozone will be minimal. Winter releases in storms will minimize exposure of these constituents to ultraviolet radiation. Rapid dissipation of these plumes downwind from the dispensers will further minimize effects on air quality. (Further discussion on air quality is included on page 42.)

a. Effectiveness

The addition of nucleating compounds to the atmosphere would indicate an addition to air pollution. Low release rates and rapid dissipation of seeding plumes, along with minimal exposure to photochemical break down, will not measurably degrade air quality within the target area.

III. AFFECTED ENVIRONMENT

The following section gives a general review of relevant features of the Upper Feather River Basin with more specific information regarding the project area. The Plumas National Forest EIS for the Land and Management Resource Plan describes the forest environment; details of Forest Management are contained in the Plumas National Forest Land and Resource Management Plan .

A. Environmental Setting

The upper Feather River Basin, a segment of which is in the proposed project area, includes lands within the Feather River watershed above Oroville Reservoir. The upper basin contains an area of approximately 2,261,000 acres; 1,643,000 acres (roughly 73 percent) are in Plumas County. The watershed also contains large portions of Butte and Sierra Counties and smaller portions of Lassen, Shasta, and Yuba Counties. Most of the Plumas National Forest and a portion of the Lassen National Forest are contained within the basin. Lands within the Tahoe National Forest are located across the southern boundary of the basin, which follows a series of ridges between the Yuba and Feather River drainages (see Figure 1).

The Upper Feather River Basin is characterized by extensive areas of forest land, extremely rough and rocky terrain cut by precipitous canyons, and isolated mountain valleys in which grain and meadow hay are grown. Elevations within the basin vary from more than 10,400 feet at Mt. Lassen to approximately 5,500 feet to about 180 feet near the city of Oroville. At the lower elevations, dense oak groves are the dominant vegetative cover, but at elevations ranging from 1,500 to 2,000 feet, the oaks intersperse with the coniferous forests that spread throughout the remainder of the basin. Ponderosa pine, douglas fir, and white fir are the most abundant species. Forests of pine, fir, and cedar are broken by bare granitic peaks, deep and rugged canyons, and mountain valleys. Gold-bearing gravels occur throughout portions of the basin.

B. Drainage Basins

The upper part of the Feather River Basin is crossed by three parallel topographic ridges (the northern-most portion of the Sierra Nevada). These ridges run in a northwest-southeast direction, and each has a valley or series of high mountain valleys to their northeast. American Valley at Quincy and Mohawk Valley at Blairsden lie to the northeast of the Sierra Crest, Indian Valley to the northeast of Grizzly Mountains, and Honey Lake Basin to the northeast of the Diamond Mountains. Elevations range from 6,000 to 8,500 feet above sea level along the crests of the mountains and from 3,500 to 5,500 feet on the valley floors. The effect of this geography results in the development of streams of moderate gradient in the upper portion of the basin. Some of these streams flow in a northwesterly direction, while others flow in a southeasterly direction. The flow gradient increases on the tributaries as they

reach higher order streams which have cut deep and rugged canyons in a southwesterly direction along the slope of the Sierra Nevada. These main watercourses--the North, Middle, and South Forks of the Feather River--flow generally southwest through deep, rugged canyons to the Sacramento River Valley floor. The North Fork is the largest tributary, draining 2,090 square miles, and the South Fork is the smallest. All three tributaries flow into Lake Oroville.

The North Fork Feather River originates on the southeastern slopes of Mt. Lassen in Lassen Volcanic National Park. The main river channel flows south for approximately 63 miles before reaching Lake Oroville in Butte County. Included within the flow of the main stem is the East Branch of the North Fork Feather River, which extends 18 miles eastward and contains the Indian Creek and Spanish Creek watersheds. More than 30 small tributaries terminate along the North Fork. The upper watershed is characterized as a plateau-like basin that is densely timbered except for several large meadow areas. The largest of these meadows, named Big Meadows in pioneer times, is now inundated by Lake Almanor, a 39-square-mile reservoir. Other major storage reservoirs within the drainage include Antelope Lake, Bucks Lake, Mountain Meadows Reservoir, and Butte Valley Reservoir.

The Middle Fork Feather River begins in the northeastern corner of Sierra Valley, where it is joined by Little Last Chance Creek. This river is approximately 108 miles long and flows southwesterly through the Plumas National Forest to Lake Oroville, draining an area of approximately 1,200 square miles. Major impoundments within this drainage include Lake Davis and Frenchman Reservoir. Extending from Beckwourth in Sierra Valley to Lake Oroville, 77-1/2 miles of the Middle Fork of the Feather River is designated as a component of the national system of the Wild and Scenic Rivers System. About 24,000 acres of public and private lands are within the designated band along the river. The mean annual natural flow of the Feather River at Oroville is estimated to be 4,244,000 acre-feet. Of this, the North Fork Basin contributes about 2,199,000 acre-feet and the Middle Fork Basin contributes about 1,166,000 acre-feet.

C. Climate

Climatic conditions within the Upper Feather River Basin west of the Sierra Nevada Crest are influenced by a typical Mediterranean pattern of wet winters and dry summers, except for summer thunderstorms and showers at the higher elevations. East of the Sierra Crest, the marine influence lessens and the climate becomes more continental, with warmer summers and colder winters, a greater range in daily and seasonal temperatures, and lower humidities. Topographic variations result in dramatic changes in temperature, wind velocities, and precipitation amounts within short distances.

Winter storms from the Pacific Ocean bring precipitation that falls as rain at the lower elevations and as snow at higher elevations. Precipitation is heaviest on the west side of the Sierra Nevada up to about the 8,000-foot elevation. Although storms usually move through

the area from the west or northwest, surface winds during periods of precipitation are primarily south to southeasterly due to the cyclonic effect of storms, with local modification of wind direction at the surface caused by the orientation of ridges and valleys.

The Upper Feather River drainage is unique when compared to other northern Sierra watersheds. The Feather River is an "over-the-barrier" catchment rather than a "windward catchment", similar to the American and Yuba watersheds. The major Sierra Nevada barrier ridge splits in the vicinity of Sierraville, traveling north and arcing around to an east-west orientation south of the primary watershed of the Feather River. A secondary ridge begins at the lower portions of the North Fork and runs northward beyond Lake Almanor. The cold storms from the west result in the strongest and deepest orographic effect in the South Feather River Basin.

The mean seasonal depth of precipitation in the upper Feather River Basin increases with elevation ranging from about 27 inches at Oroville to over 80 inches in the vicinity of Bucks Lake and decreases to about 20 inches on the crest of the Diamond Mountains and to less than 10 inches in parts of the Sierra Valley (see Figure 9). Ninety-five percent of the precipitation occurs during the winter months. A snowpack of 60 to 120 inches or more is typically present from December through May at elevations above 5,000-6,000 feet. Snowfall may exceed 300 inches at the higher and most humid locations. The actual accumulation of snow on the ground varies greatly with elevation. Melt-off between storms typically occurs throughout the winter season. A typical central Sierra Nevada maximum, minimum, and average annual snow depth chart is included as Figure 10.

Temperatures in the mountain valleys are moderately severe, with minimums below freezing during the period from November through March. The summers are generally warm during the day, but cool during the night. Frosts may occur in any month of the year.

D. Geology

The Upper Feather River Basin is bounded on the northwest and north by volcanic ridges and mountains, including Mt. Lassen, which are a part of the Cascade Range geomorphic province. On the northeast and east, the basin is bounded by prominent, east-facing fault scarps located near Honey Lake and along the east margin of the Sierra Nevada. The northern and eastern boundaries of the basin roughly correspond to the northern and eastern boundaries of the Sierra Nevada geomorphic province. On the south, the boundary of the Upper Feather River Basin follows a series of ridges which are part of the western slope of the Sierra Nevada.

The Sierra Nevada is a complex mountain range composed of metamorphic and igneous rocks. Faulting, tilting, and uplift of the Sierra Nevada formed the extremely steep, eastern escarpment and resulted in the carving of deep canyons by youthful streams on the otherwise

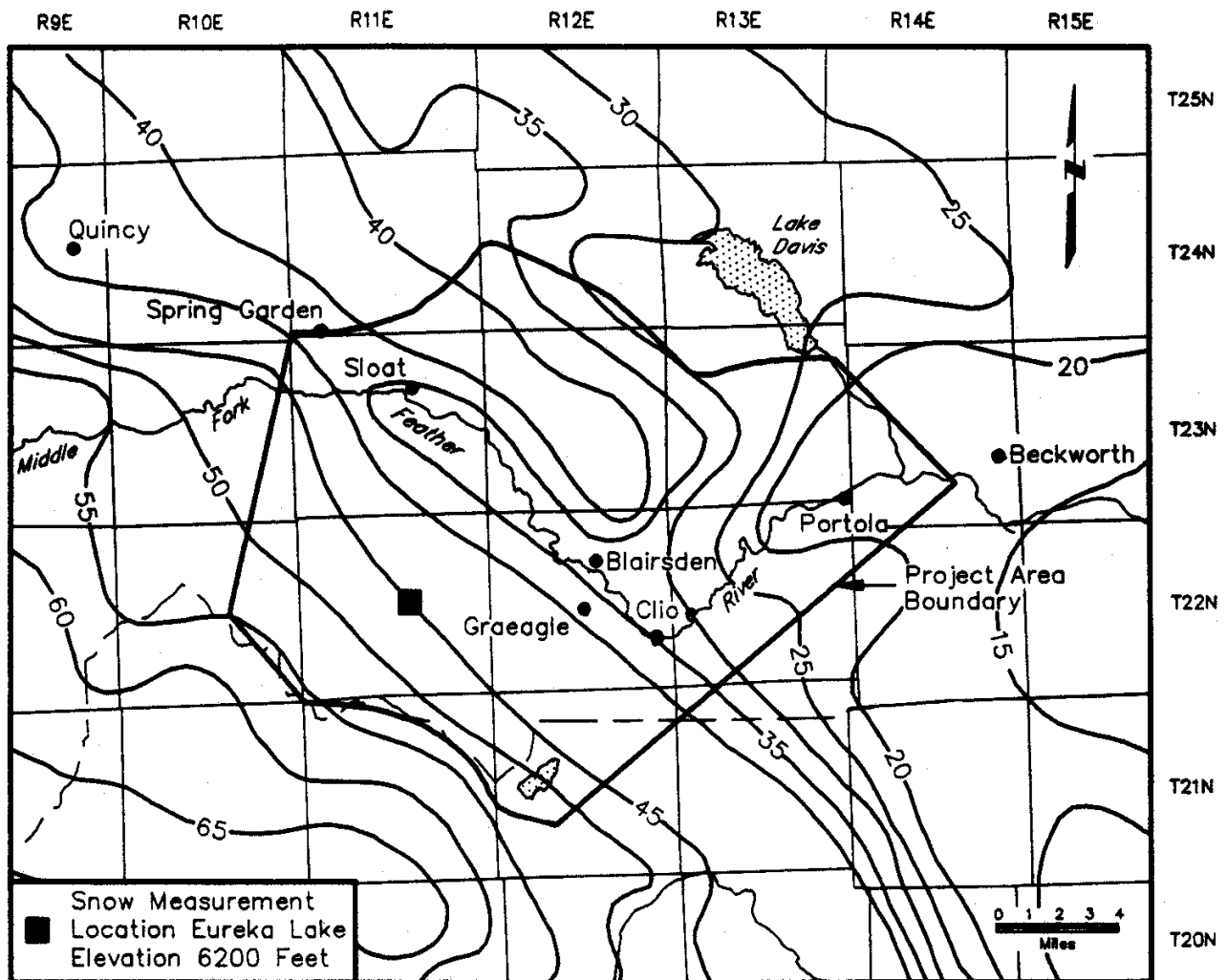


Figure 9. Lines of equal Precipitation in Project Area (in Inches).

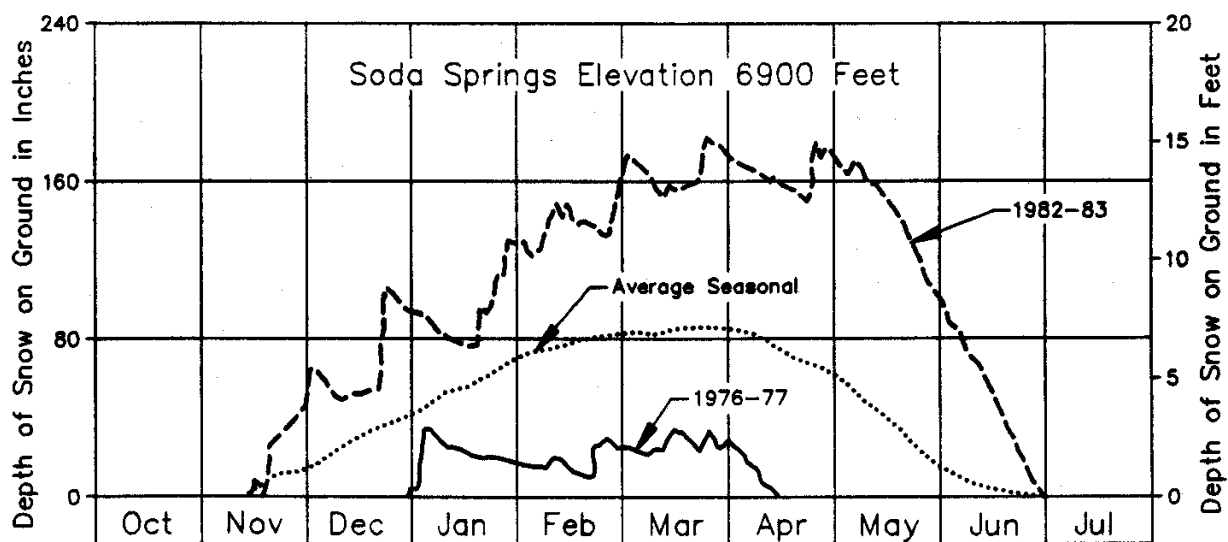


Figure 10. Historic Snow Depth measured at Central Sierra Snow Laboratory near Soda Springs California.

gentle western slope. In the Upper Feather River Basin, the Sierra Nevada has been modified by additional faulting which has produced several prominent scarps and has influenced the formation of all major valleys in the basin.

The major structures trend northwest, parallel to the crest of the Sierra Nevada. Older rocks in the area are metamorphic, ranging in age from Silurian (about 350 million years old) to Jurassic (about 150 million years old). These metamorphic rocks are sedimentary and volcanic in origin. Masses and dikes of granite and gabbro irregularly intrude the older rocks.

Serpentine, which is a moderately soft, predominantly green alteration product of ultra-basic intrusive igneous rocks, is prominent in the area. An almost continuous broad band of serpentine crosses the entire drainage area from southeast to northwest. The band crosses the Middle Fork of the Feather River 4 miles below Nelson Point, passes through Meadow Valley, and crosses U. S. Highway 70, the East Branch of the North Fork in Serpentine Canyon, and the North Fork of the Feather River about 3 miles above Belden. The band is about 3 miles wide where it crosses the Middle and North Forks of the Feather River.

Younger deposits in the upper Feather River Basin include auriferous gravels, volcanic rocks, lake sediments, and alluvium. The gravels were deposited from Eocene to Miocene time (between about 70 million and 20 million years ago). Remnant gravel deposits are found on the crests of several ridges and indicate evidence of the difference between the ancient prevolcanic stream drainage pattern and the drainage pattern of the Feather River today.

Many gravel deposits were buried by volcanic rocks (lava flows, tuffs, beds of volcanic boulders, and ash), which at one time blanketed the eastern two-thirds or more of the area. In the eastern part of the area around Sierra Valley, much of the thick volcanic cover remains today. In addition, erosional remnants of the great mass of pyroclastic debris still remain on many of the high ridges in the central part of the basin. These lava flows and beds of pyroclastic debris were laid down during late Miocene and early Pliocene time (about 10 to 15 million years ago).

Structural dislocations and depressions in parts of the Sierran block form several valleys in the Upper Feather River Basin. Since early formation of the valleys, sediments have accumulated almost continuously. Lake sediments and stream deposits are predominant in most valleys, volcanic ash is abundant in some valleys, and glacial debris and wind-blown material have been noted in other valleys. All of these materials are known to be erosive in drainages with high gradients.

The larger of these complex alluviated valleys are: Sierra Valley, Mohawk Valley, Big Meadows Valley (now inundated by Lake Almanor), Mountain Meadows Valley (partially inundated by Mountain Meadows

Reservoir), Indian Valley, American Valley, Meadow Valley, Grizzly Valley, and Genesee Valley. Smaller alluviated areas are also found in such well-defined valleys as Squaw Valley, Clover Valley, and Little Last Chance Valley.

The youngest sediments in the Upper Feather River Basin are recent stream channel deposits. These consist of boulders, gravel, sand, and silt. Channel and terrace gravels have yielded gold at many localities.

No appreciable movements along major faults have been recorded within the Upper Feather River Basin. However, faults in adjacent areas are considered active.

E. Soils

Soils in the Upper Feather River Basin vary markedly in composition, depth, and other physical and chemical properties. These variations result from differences in parent material, mode of formation, degree of development, and climatic factors. In general, the soils can be divided into the following five broad groups:

1. Residual soils which have been formed in place by disintegration and weathering of underlying consolidated sedimentary and igneous rocks.
2. Old valley-filling soils which have undergone marked changes in profile characteristics since their deposition.
3. Recent alluvial soils which occupy the floodplains and upland meadow valleys and have been derived from sediments transported from the immediate surrounding area. There has been little change in the physical and chemical properties of these soils since their deposition.
4. Lacustrine soils, some of which have undergone pronounced changes in profile characteristics since their deposition.
5. Organic soils which have been derived mainly from decomposition of organic materials under marshy conditions.

The residual soils occur on hilly and mountainous lands throughout the basin. Depths of soil vary from thin soils with considerable rock present on the surface and throughout the profile to very deep soils with little or no rock evident.

Soils derived from old valley deposits and remnants of former alluvial fans, although not extensive in the upper basin, are found along the western side adjacent to the Sacramento Valley floor. Soil-forming processes have brought changes in profile characteristics during the period following deposition of the unconsolidated materials. Leaching processes have resulted in formations of dense clay pans and, in some cases, cemented hardpans.

Recent alluvial soils occupy the floodplains and smaller meadows along streams and occupy the greater part of the larger mountain meadows such as American Valley and Indian Valley. These soils, in general, have undergone little or no change in their profile characteristics since deposition. Where properly drained, the Recent alluvial soils have wide crop adaptabilities and are highly valued as agricultural lands.

Soils derived from lacustrine depositions occupy the greater part of Sierra Valley. As is common with the deposition of sediments into a freshwater lake, coarser materials are found at the margins of the valley and the finer materials are found in the central portions of the valley.

Thus, a wide textural range has been developed with a predominance of fine- or medium-textured soils. This soil condition creates drainage problems which are responsible in large part for much of the salinity and alkalinity conditions that are found in Sierra Valley.

Within Indian Valley, there are small areas of soils that have been derived largely from the deposition of organic materials. They are normally deep, medium to fine textured, and suited to a wide variety of climatically adapted crops.

Generally, the warmer and more humid west side of the basin has deeper, more productive soils, particularly on north-facing slopes. The cooler and more arid east side has shallow, less-productive soils.

F. Biological Environment

Westside mixed conifer is the major vegetation association present, comprising about 55 percent of the vegetative cover in the basin. Predominant species of this association include ponderosa pine, sugar pine, douglas fir, white fir, and incense cedar. Westside mixed conifer association is the dominant vegetation type from 2,000 to 6,000 feet. Other major vegetation associations present are eastside mixed conifer, eastside pine, oak woodland (below 4,000 feet), red fir (generally above 6,000 feet), ponderosa pine, and sagebrush. Less widely distributed vegetation associations are climax chaparral; freshwater communities, pine-juniper woodland, wet meadows; rocky areas, lodgepole pine, riparian deciduous, dry grassland, digger pine-oak, and mountain hemlock (above 6,000 feet). At least nine USFS-designated sensitive species occur in the Plumas National Forest. These species include Arbis constancei, Fritillaria eastwoodiae, Lupinus dalesiai, Mondardella stebbinsii, Penstemon personatus, Sedum albomarginatum, Silene invisa, and Vaccinium coccinium.

Lists of vegetative species in the different life zones of the basin can be found in Appendix VI of the Comprehensive Framework Studies of the California Region IA, Water Resources Council.

Rare plant species of concern that occur or may occur within the project impact area and their habitat requirements are included as Appendix D of this report.

The basin provides habitat for hundreds of vertebrate species common to the Northern Sierra Nevada in addition to two federal- and State-listed endangered species--the bald eagle and American peregrine falcon--as well as several "sensitive" wildlife species. The Plumas National Forest Land and Resource Management Plan Environmental Impact Statement references the presence of 313 vertebrate species, including 206 bird, 50 mammal, 26 reptile and amphibian, and 31 fish species.

Primary sport-hunting species are blacktail and mule deer. The basin contains the entire range of the Mooretown and Sloat deer herds and portions of the summer and winter range for the Bucks Mountain, East Tehama, and Doyle deer herds. Other game species include black bear, gray squirrel, beavers, mountain quail, blue grouse, California quail, ring-necked pheasant, turkey, mourning dove, and various waterfowl.

Most lakes and reservoirs within the Feather River drainage contain trout, and a few contain kokanee and other game and nongame fish. Two-thirds of the streams surveyed within the Plumas National Forest contain rainbow, brown, or brook trout as the predominant species. The California Department of Fish and Game stocks many streams with trout, but portions of Yellow Creek, Nelson Creek, and the Middle Fork Feather River have been designated by the State as "Wild Trout Streams" containing native species of trout. Reservoirs at lower elevations and a few mid-to-upper elevation reservoirs support a considerable number of warmwater fish.

G. Land Use

While gold was the original lure that brought immigrants into the Upper Feather River Basin, it was the vast stands of trees, large mountain meadows, hydroelectric power potential, and the trans-continental railroad that were primarily responsible for the present distribution of development and population. For many years, mining was the primary economy of the region. However, in recent years, economic and resource conditions have decreased the importance of mining, and increased the economic importance of timber harvesting.

The timber industry has grown from a few sawmills in the 1850s to become a primary industry in the Feather River Basin. The timber resources in the watershed exceed 21 billion board-feet, approximately 70 percent of which are in public ownership. Firs and pines account for nearly all the timber production.

Early settlers in the mountain regions were attracted by the favorable conditions for raising livestock. Grasses grew abundantly during the spring, and streams were easily diverted onto the flat valley lands to irrigate hay and summer pasture crops. Nearly all

the present agricultural activity in the basin centers around livestock grazing in the high mountain valleys and is primarily dependent upon natural streamflows. The predominant crop in the high mountain valleys is pasture.

During the past 50 years, the North Fork Feather River has been extensively developed for hydroelectric power production. PG&E operates four major storage reservoirs, ten powerplants (Big Bend Powerplant was inundated by Lake Oroville), and several regulating reservoirs. The hydroelectric power system on the North Fork Feather River has a power capacity of over 700 megawatts (MW). On the South Fork, the Oroville Wyandotte Irrigation District (OWID) is operating a system with a generating capacity of over 90 MW. On the main stem Feather River, the Oroville-Thermalito Complex of the State Water Project has an installed generating capacity of about 760 MW.

The Plumas National Forest contains the 21,000-acre Bucks Lake Wilderness Area and two Special Interest Areas (SIAs), Butterfly Valley Botanical Area and Feather Falls Scenic Area. Several other areas are under consideration for SIA or Research Natural Area status at this time. The project area includes the Lakes Basin Recreation Area, Plumas-Eureka State Park, and other land allocated to semi-primitive management.

The Middle Fork Feather River from Oroville Reservoir upstream to above Portola is designated as a Wild and Scenic River. This designation provides for restrictive management activities within its defined boundaries and assures protection of riparian dependent resources. There is no restriction for incrementally increasing runoff through weather modification effort.

The State Department of Fish and Game has designated Nelson Creek as a "wild trout stream" from its confluence with the Middle Fork of the Eel River upstream to the confluence of the East Branch Nelson Creek and West Branch Nelson Creek. The goal of the Wild Trout Program is to preserve unique stream trout fisheries which are naturally sustained by wild strains of trout. Guidelines include maintaining and enhancing, where possible, the habitat required for optimum wild trout production, preserving the natural character of streamside environment, and preventing adverse impact by land or water development projects.

The Pacific Crest Trail traverses the length of the project area. The trail is administered by the Forest Service which has a policy to maintain high visual quality along the trail with foreground views being kept near their natural appearance but allows reduced visual quality on adjacent timberlands. As stated in their visual quality objectives, they will attempt to employ a "partial retention" in those areas viewed as foreground from the trail but allow modification in the middle and background areas.

The forested mountains, lakes, and streams of the primitive portions of the upper Feather River offer unusual recreational opportunities.

Year-round tourist accommodations are provided, but many parts of the basin can be reached only during the summer months. Recreation and travel by vacationers and tourists contribute an appreciable sum of the total income to the basin.

H. Primary Precipitation Enhancement Area

The proposed primary target area for enhancement is defined by the dispenser locations forming a northwest to southeast alignment generally following the Sierra Nevada Crest from Pilot Peak to the higher elevations above Gold Lake (see Figure 2). The northwest boundary, extending downwind of the dispensers, indicates the limit of influence from southerly storms; the southeast boundary indicates the limit of influence of westerly storms. The northern boundary generally follows the Sierra Nevada Crest between the Middle Fork Feather River and East Branch North Fork Feather River basins.

Eight of the ten proposed dispenser sites are located in the Plumas National Forest and two are in the Tahoe National Forest. The effective primary enhancement area is located almost totally within the Middle Fork Feather River drainage and the Plumas National Forest. The area of impact includes the Middle Fork of the Feather River as it traverses the area from Portola on the east to below Sloat on the west. The major streams discharging to the Middle Fork in this stretch of the river are all of the catchment areas of Willow, Frazier, Gray Eagle, Jamison, Long Valley, and Poplar Creeks.

Due to the placement of the dispensers, three other major streams will only be partially impacted as their catchment areas are not totally within the area of impact from the tracks of the storms that can be seeded. These partially impacted streams are the lower ends of Big Grizzly and Sulphur Creeks and the upper catchment area of Nelson Creek, above the area designated as a wild trout stream. A more detailed discussion on possible effects on Nelson Creek is included as Appendix C.

The communities of Sloat, Cromberg, Johnsville, Plumas-Eureka Estates, Mohawk, Blairsden, Delleker, Graeagle, Clio, and Portola are located within the project boundaries. The area is accessible by Highways 70 and 89, the Gold Lake Highway, and Union Pacific Railroad.

Elevations in the enhancement area range from 7,812-foot Mt. Elwell along the Sierra Nevada Crest to approximately the 4,000-foot level of the Middle Fork Feather River west of Sloat. Smith Peak at the southeastern end of Grizzly Ridge reaches 7,688 feet. Mohawk Valley is situated at about 4,300 feet.

Mean monthly temperatures below freezing occur at Portola during the months of December and January. August, the warmest month, has an average daytime temperature over 26.4 degrees C (80 degrees F). Portola, on the east side of the enhancement area, receives

significantly less precipitation (less than 20 inches) than the more westerly portion of the enhancement area, which attains an annual average up to 60 inches (Figure 8).

I. Extra Area Effects

Effects analyzed under CEQA definitions must be related to physical change. Effects and impacts are synonymous. Extra area effects could occur as increases in snowfall outside the intended target areas (see Figure 1).

These increases downwind happen because the seeding agent or artificially produced ice crystals continue past the intended boundary and produce additional snow downwind until the seeding agent or ice crystals have been exhausted.

IV. ENVIRONMENTAL ISSUES

This section provides the scientific and analytical basis for the comparison of alternatives to implement the project. The section also describes the probable environmental consequences of implementing each alternative.

A. Long-Term Impacts

CEQA gives no definition of "long term". For the purposes of this report, "long term" will be interpreted as "lasting beyond the period of study or operation of the program". This project is scheduled for a limited number of years in providing data to evaluate the potential efficiency and effectiveness of the cloud-seeding program in the Feather River Basin.

No adverse "long term" impacts can be identified as occurring from alternatives 1, 2, or 3; any impacts will cease upon completion of the five-year data collection period.

B. Short-Term Impacts

The "short-term" impacts identified are land-disturbing or aesthetic activities.

The land-disturbing activities would occur in a small area surrounding each of the dispensers and precipitation gauges during installation procedures. These land-disturbing activities can be minimized by the careful placement of the disturbed soil as near to the original conditions as possible which would reduce the possibility for increased erosion.

The aesthetic impacts are from the 10 to 30 round-trip helicopter flights over a roadless area (see Figure 4) that will occur for a 1- to 3-day period every November and May. These helicopter flights will follow the same path generally used for all placement and retrieval of the snowpack augmentation equipment and measuring devices and for the transportation of the work force.

Placement of year-round towers required in Alternative 1 may result in a visual (esthetic) impact to summer recreationists during the life of the project.

However, beneficial "short-term" impacts from Alternatives 1, 2, and 3, lasting as long as the proposed project is operated, would result from the slight increase in runoff and the extended number of days of runoff from the added snowpack. This is due to the project being designed to add to the natural snowpack within its natural variations in the catchment area of this segment of the Middle Fork of the Feather River. The additional snowpack could also aid in the enjoyment of the area by snowmobiles and cross-country skiers. Slightly higher flows and a number of extended days of flow will improve the aesthetic and biological characteristics of the stream.

C. Precipitation

Snowpack and rainfall monitoring will be conducted over the entire elevation range throughout the project area for Alternatives 1 and 2. Changes in the amount and intensity resulting from the proposed cloud-seeding operation are expected to be well within natural variations.

1. Alternative 1 - Ten Surface Located Dispensers Using Silver Iodide (AgI) as the Seeding Agent

The seasonal enhancement of augmented precipitation under this alternative that is expected in the primary target area under ideal conditions converts to 6,000 acre-ft. Six-thousand acre-ft assume 100 hours of seedable storm conditions per season. Approximately 40 hours of storms will be left untreated due to randomized seeding and periods where suspension criteria have been exceeded. The average rate increase within the target area is anticipated to be .01 inch/hour (see Appendix D). This amounts to approximately 0.6 inch additional snow-water equivalent distributed over the primary target area. As this is nearly an order of magnitude below the expected effects from the recently completed DWR Drought Alleviation Program, the Initial Study - Negative Declaration, drafted for that program will more than adequately cover the impacts of ground-based silver iodide seeding and are thus hereby included into this document by reference (DWR, 1989).

Precipitation will be evaluated by using rain-snow gauges to be installed in the primary target area. To properly evaluate the program, seeding will be randomized. A storm will be segmented into 8-hour blocks. Two out of every three 8-hour periods will be seeded with the third left untreated. The combination of randomization and having precipitation measurements within a control area (unaffected by seeding) to compare to precipitation within the target area will constitute the evaluation scheme. Given only 60 hours per season of treated storms, this will allow for only 8 seeded units plus 2 untreated per season. Assuming

that the precipitation increases are on the order of 15 percent per 8-hour unit, it could take nearly 50 seed, no-seed pairs (100 units) to obtain statistically significant results on precipitation increases. At 10 units per year, it will take 10 years to obtain meaningful results.

A possible second problem in evaluating AgI seeding that has been observed on other projects is that the silver iodide aerosol can stagnate in low-lying valleys for several hours or days after being released. As experimental release units can be consecutive, it is possible a portion of the storm meant to be left untreated could be treated by the residual AgI trapped in the valleys. This would bias evaluation of the seeding effects.

The benefit to cost ratio for this alternative will be rather low. Cost for the silver iodide dispensers are quite high and maintenance will be necessary quite often. Given these factors and the rather low yield, the benefit/cost will likely be below 0.5.

The extended length of time to obtain statistically significant results and the possibility of a storm being seeded by residual AgI trapped in low lying areas make it doubtful that this study will be pursued if AgI is required to be the seeding agent.

2. Alternative 2 - Ten Surface Located Dispensers Using Propane as the Seeding Agent

The seasonal quantity of augmented precipitation that is expected within the enhancement area under ideal conditions is 32,000 acre-feet, based on 160 hours of treated storm periods per season. This number has been reduced to account for randomization (one-third of hours left untreated) and for periods when suspension criteria have been exceeded. Obligatory suspension of project activities for specified conditions in combination with randomization is expected to reduce opportunities by 50 percent over the life of the project.

Based on historical data from PGandE and other USBR sponsored projects along with numerical model results for this basin indicate that under average storm conditions, or over the course of an entire winter season, a majority of the augmented precipitation will occur within the first 15 miles downwind of the propane dispensers. Based on a calculated hourly precipitation rate increase of .01 inch/hour, this equates to an average increase of about 2 inches in seasonal precipitation within the primary target area.

Precipitation monitoring will be conducted over specified elevation ranges throughout the primary target area. Changes in precipitation amount, intensity, and duration resulting from the proposed cloud-seeding operation are expected to be well within natural variations. Using 160 hours of seeding per season plus

100 hours left untreated periods, approximately 22 seeded and 12 unseeded randomized treatment periods can be obtained each season. At the end of the 5-year program, a sufficient sample size should exist to properly evaluate the magnitude of precipitation increases.

The benefit to cost ratio for this alternative is expected to be about 2 to 1. This assumes that all runoff prior to the spring maximum is utilized for hydroelectric generation and that spring runoff is utilized for both hydro and agricultural and domestic use.

3. Alternative 3 - One to Three Surface Located Dispensers Using Liquid Propane as the Seeding Agent

The small quantity of augmented precipitation produced and the difficulty of targeting a very small number of dispensers accurately make physical evaluation of this alternative infeasible. This alternative would therefore not meet a primary objective for undertaking a prototype project. Its benefit would be to proving the technology of remotely controlling the release of liquid propane under extreme weather conditions and as a repeated first step in the implementation of a larger area prototype project, such as Alternative 2.

4. Alternative 4 - No Project

This alternative precludes the use of any type of ground-based, snow augmentation generators, but provides a base line for comparing the environmental effects of the other alternatives considered in this document. The decision not to proceed with a prototype project to cloud seed would not create an environmental impact.

D. Extra-Area Effects

Extra area is described as the downwind area from the dispensers that is beyond the prime target area proposed for snowpack enhancement but could be affected by the cloud-seeding agent. It is an area that could be affected if ice-nucleating, seeding agents such as silver iodide were used.

1. Alternative 1 - Ten Surface Located Dispensers Using Silver Iodide (AgI) as the Seeding Agent

Under this alternative, there is likely to be downwind effects from the ground-based release of AgI. AgI has the characteristic that it becomes more active at colder temperatures. That is, its ability to produce ice crystals increases by orders of magnitude from -5°C to -10°C . Thus, unless the aerosol is completely nucleated at or near the -5°C level, it will continue to produce more ice crystals as it moves downwind and up through the cloud. This effect will continue until the aerosol

moves out of the cloud. The tendency would be that the downwind effect would be similar in magnitude to those in the primary target area. The downwind area will extend as far as the cloud extends, which for this area will probably be 35 miles downwind to the Diamond Range. These downwind effects can be minimized if seeding was restricted to temperatures colder than -8°C at the dispenser altitude. However, this would reduce the number of hours of seeding to less than 20 hours per season.

In order to determine the magnitude of these downwind effects, it would be necessary to install similar precipitation gauges as those in the primary target in the downwind area. Since the downwind area will be two to three times as large as the primary target area, two to three times more gauges will be needed.

2. Alternatives 2 and 3 - Surface Dispensers Using Propane (C_3H_8) as the Seeding Agent

Only minimal extra-area effects are anticipated from Alternatives 2 and 3. This is due to the instantaneous nucleation of ice embryos within a few inches of the propane nozzle. Once the ambient air that has been chilled by propane vaporization warms to above zero, propane can no longer generate ice crystals. Thus, it is simply a function of wind speed as to how far the crystals will fall out downwind.

3. Alternative 4 - No Project

This alternative precludes the use of any type of ground-based, snowpack augmentation generators. Snowfall will remain influenced only by natural conditions. Limited base-line information will be available.

E. Air Quality

Very little air quality data have been collected for this portion of California. The project area is located within the upper reaches of the Sacramento Valley air basin and prevailing winds generally bring air from the southwest, an area of agricultural and urban development. Incoming air from this area along with dust, smoke from both wildfire and prescribed fire, wood-heating and industry emissions, and automobile exhausts are sources of degradation to the air quality in the project area. In general, consequent air quality loss is not substantial and the quality of the air is high.

Clean air is a State and National priority embodied in maximum allowable pollutant concentrations. Silver iodide (Ag I) is the form of silver used in cloud seeding. It is exceedingly insoluble in water, essentially inert and has no known toxicological properties. The California Air Resources Board has not included silver in its air quality standards.

When released to the atmosphere during cloud-seeding operations, extremely low concentrations ranging from 0.003 $\mu\text{g/l}$ to 0.5 $\mu\text{g/l}$ have been measured in the seeded precipitation.

A threshold limit value for silver in workroom air has been set at 0.01 mg/m^3 by industrial hygienists. According to a study made for the National Institute of Environmental Health Sciences, atmospheric silver emissions have yet to produce any reported ambient air concentrations approaching this threshold limit value.

Silver can potentially move to soil, plants, and water. One study calculated these low concentrations would not cause silver levels in soil to increase significantly beyond background levels for hundreds of years (CSU, 1970).

The U. S. Environmental Protection Agency (USEPA, 1986), however, has recommended criteria for protection of freshwater aquatic life from effects of total recoverable silver at 10 $\mu\text{g/l}$ for acute exposure and 0.12 $\mu\text{g/l}$ for chronic exposure.

The U. S. Public Health Service Drinking Water Standards for 1986 has set a limit of 50 mg/l , not because of health danger, but to prevent cosmetic effects of skin darkening.

Iodine has no toxicological concern as it is common in the environment and is an essential element. The accepted threshold level for humans is 1 mg/l of iodine vapor per cubic meter of air.

Propane is a simple hydrocarbon (C_3H_8) normally stored in a pressurized tank used worldwide for heating, cooking, and as a fuel for motor vehicles. Normally, it is used by igniting the propane vapor which burns with a luminous, smokey flame. For propane to ignite it must be mixed with air at a ratio of 2.3 to 9.5 percent by volume. As propane vapor is heavier than air, it can displace air and therefore is classified as an asphyxiant. This requires, however, that the propane be allowed to pool to concentrations greater than 10,000 ppm. The threshold limit value (tolerance limit for breathing by man) for propane is 1,000 ppm. Accordingly, there are currently no State or Federal ambient air quality standards for propane.

As propane is a hydrocarbon, it is subjected to photochemical oxidation. That is, in the presence of sunlight the C_3H_8 molecule will react with an OH molecule to form C_3H_7 and H_2O . Given that O_2 is present and nitrous oxide (NO) is present in small amounts even in clean atmospheres, the primary products produced NO_2 and $\text{C}_2\text{H}_5\text{CHO}$ (propionaldehyde) and H_2O . The propionaldehyde can then react with the OH molecule to begin the process again. The NO_2 can be further reacted with to form a free oxygen molecule that can react with O_2 to form ozone. All of these processes require sunlight, which is lacking during winter storm conditions when propane releases will be made. With rapid mixing and dispersal of the propane aerosol, the

oxidation process will be extremely slow and the concentrations of the products described low. Note, however, that CO_2 is not a primary product of the oxidation process. Thus, because the carbon atom is strongly bonded to the hydrogen molecule and takes a process like combustion to free the carbon atom and thus bond with O_2 forming CO_2 . Therefore, the contribution of propane seeding to the "Greenhouse Effect" is negligible in this environment if propane is released to the atmosphere without being combusted.

1. Alternative 1 - Ten Surface Located Dispensers Using Silver Iodide (AgI) as a Seeding Agent

The silver iodide used for cloud seeding is in a solution that is burned in acetone, using propane as the combustible. This produces a nearly pure silver iodide aerosol particle. Approximately 0.33 gallon of silver iodide solution is burned in 1 gallon of propane each hour. This process will lead to the production of CO_2 and other compounds that could photochemically react under the proper conditions to form oxides of nitrogen and ozone. However, because of the low rates of release along with the limited amount and time of year of this seeding, very little, if any, detectable pollutants can be measured. Also, the CO_2 produced will have negligible impact on the greenhouse effect, given the source strengths being discussed. Using this alternative, the amount of hydrocarbons emitted by seeding in a year would be equal to two gasoline-powered automobiles operated for the same time period.

2. Alternatives 2 and 3 - Surface Dispensers Using Propane (C_3H_8) as a Seeding Agent

Unignited propane will be released from dispensers located approximately 1 to 2 miles apart. The release rate could be less than 3 gallons of liquid propane per hour per dispenser. Experimental release rates of up to 6 gallons per hour will be conducted on a limited number of storm events.

Propane is a biologically inactive gas, and harmful health effects occur only if it is present in high concentrations. Threshold safety limits for propane in the atmosphere have been established at 1,000 parts per million (ppm) by the Department of Public Health, but humans can tolerate it in much higher concentrations. In 1969, the U. S. Air Force initiated a program to dissipate cold fog over their air fields by releasing propane from ground-based dispensers. Data from this successful program, which released propane at the rate of 10 gallons per hour per dispenser, showed rapid dilution of the releases and that atmospheric concentrations were reduced to one part per million at ground level two miles downwind from the dispenser.

As all releases of propane for the alternatives proposed for this DWR proposed project will be during highly turbulent winter

storms, and at approximately one-fourth the rate of the Air Force studies, it is expected that the propane will be rapidly diluted and undetectable a short distance downwind.

A stenching compound, ethyl mercaptan (C_2H_5SH) is added to all propane sold in the United States. Its purpose is to aid in detecting propane leaks. The organic compound is added at the miniscule ratio of 2 to 3 ounces for every 1,000 gallons of propane.

The Air Force studied releases of stench propane at a rate of four times the DWR proposed seeding rate of less than 3 gallons per hour and determined that the obnoxious odor also rapidly dissipated in the atmosphere and could not generally be detected 1/4 mile downwind.

It is not likely that a cross-country skier or traveler in the area would be detrimentally exposed to higher concentrations of the released propane for the following reasons: (1) the releases will occur only during the harsh winter snow storms that are not conducive to travel; (2) the dispensers are located on exposed peaks or ridges where air is most turbulent that will rapidly mix and dilute the propane; (3) dispensing nozzles are located approximately 12 feet in the air; and (4) the propane will be released at a low rate of 2-1/2 gallons per hour.

Upon being released to atmospheric pressure, liquid propane vaporizes to a gas within about 20 inches of the nozzle. From this point, the vapor drifts with the air currents as the air moves up and down over mountainous terrain. Therefore, it will disperse at approximately the same rate as the ice crystals or about 3 feet per second.

The major environmental concerns over the use of propane is its possible contribution to air pollution and impact on global warming. The propane dispensers do not release particulate matter. As a comparison, the output of hydrocarbons from ten dispensers operating for six months is equivalent to about half of the average day's emissions from all automobiles operating in Plumas County (Air Resources Board Report, 1988). Since propane is a hydrocarbon, it will oxidize photochemically. That is, in the presence of sunlight, the C_3H_8 molecule will oxidize to form water vapor, oxides of nitrogen and a propane aldehyde. The oxides of nitrogen can be further oxidized to form ozone.

However, all of these processes require sunlight. Given that liquid propane for this project will be released in the winter during storms with more than half of the events taking place at night and with rapid mixing and dispersal of the propane aerosol, the oxidation process will be somewhat slower than in summer time. Some of the oxidation products are gases that have been called greenhouse gases. This includes NO_2 and H_2O . However, there is no empirical or theoretical information on the

amounts of these gases produced by the oxidation of propane since other hydrocarbons released into the environment produce similar compounds, making it impossible to track the direct impacts of propane (Prof. Rowland, U. C. Irvine, personnel communication).

3. Alternative 4 - No Project

This alternative precludes the use of any type of ground-based, snowpack augmentation generators. The air quality in the project area will remain subject to man-made activities, such as contributions from automobile exhausts and emissions from woodburning stoves.

F. Water Resources

The following issues are generic to Alternatives 1, 2, 3, and 4.

1. Rain-Snow Level

The freezing level during seeding operations will typically occur at 5,500 feet. The rain-snow line is usually 1,000 feet below this or 4,500 feet. On the average, about one-half of the precipitation occurring at the 4,500-foot elevation will be snow.

2. Length of Winter

For most climatological applications, the length of winter is defined as the earliest and latest occurrences of certain temperature limits, either in terms of averaged temperatures or in terms of killing frosts (Project Skywater, Final Environmental Statement, p. 3-23).

The proposed action will not affect the daily temperature regime or the predominant temperature patterns of the project area. Therefore, it is believed that the proposed action will not have an effect on the duration of the winter season. No significant effect would be anticipated on the climate of the project area during the period of operation.

3. Snowpack

Total increased precipitation for the entire primary project area is expected to average less than 5 percent or about 0.1 inch per 8-hour storm event.

The conversion of water equivalent percentages to actual snowpack is difficult. Snowpack depth and density vary considerably during the winter season and from year to year. A 16 to 20 inch increase in winter snowfall within the primary target area will result in an increased snowpack in average to below-average snowfall years. The expected incremental increase in snowpack is well within the normal range of variation.

4. Extent of Delayed Snowmelt

Wind activity and topography prevent snow from falling evenly over an area. Delayed snowmelt would occur primarily in protected areas and locations that accumulate a disproportionately large quantity of snow. Increased time for snowpack melt-out will vary according to amount of augmentation, time of augmentation, effect of rain or increased snow on the snowpack, and many other factors, such as temperature regime and amount of cloudiness and sunshine.

Based on previous USBR studies (summarized in the Sierra Cooperative Pilot Project-Environmental Assessment, 1981), incremental increases in Sierra Nevada snowpacks resulting from an increase up to 8 percent in snowfall do not create lingering snowpacks of significance to the physical and human environment. It is estimated that the delay in snowmelt will extend from 0 to 3 days. Snowpack modeling studies sponsored by USBR in the Sierra Nevada and Colorado Rocky Mountains and studies sponsored by the Utah Division of Water Resources in the Uinta Mountains (Haper, 1981) indicate that a very small percentage (1-3 percent) of the total area would tend to have delayed snow-free period beyond 3 days.

5. Ground Water

Snowmelt was artificially extended 11 days at the Central Sierra Snow Laboratory, near Soda Springs (Mac Donald 1986, 1987). The additional snowmelt caused a rise in ground water that expanded laterally and downslope in time. The ground water "mound" dissipated within two weeks, but higher soil moisture levels persisted for several weeks after the period of extended snowmelt. Similar ground water and soil moisture effects are expected to result from the proposed project, but within proportionally smaller time frames.

6. Avalanches

To the extent that this program increases the amount and duration of snowfall during major winter storms, it could increase the frequency of avalanches. This tendency will probably be less than proportional to the estimated increase in snowfall. In research studies aimed at identifying avalanche-triggering effects, the effects of relatively small incremental increases in snowfall have been masked by more pronounced influences of wind, temperature, and rate of snowfall (summarized in the Project Skywater-Environmental Impact Statement).

The California Department of Transportation, U. S. Forest Service, and the Plumas-Eureka State Park have been consulted regarding avalanche hazards in and adjacent to the study area. Residential areas have been located away from identified avalanche chutes.

Because project operations may have a contributory effect on some snowpack conditions which lead to avalanche conditions, the project director will suspend seeding when critical avalanche hazards are judged to exist.

7. Runoff and Floods

Total augmented precipitation is expected to add about 32,000 acre-feet to the project watershed during an ideal cloud-seeding season of near average, normal precipitation. Hydrologic runoff versus evapotranspiration modeling (WRENSS) (Swart, et al. 1986) of the Middle Fork Feather River watershed indicates that about 70 percent of the winter season precipitation contributes to streamflow. This means that roughly 22,400 acre-feet of the original 32,000 acre-foot increase will actually add to total runoff downstream of the enhancement area.

Using the 22 years of historical streamflow information for the Middle Fork Feather River below Sloat (USGS Gauge No. 11-3935, discontinued 1962), located above the confluence of the Middle Fork and Nelson Creek, the project would have increased the average annual discharge of the Middle Fork 5 percent at this location.

The primary project area encompasses approximately 350 square miles. Twenty-five percent of this area is above 6,000 feet. Ninety percent of the winter season precipitation at or above this elevation falls as snow and is generally retained in the snowpack, contributing to spring runoff. Below this level, the percentage of precipitation that falls as winter rain increases markedly to over 50 percent below the 4,500-foot level. Fifteen percent of the primary project area is below this elevation.

Increases to the snowpack contributing to measureable runoff are expected to occur primarily within 15 miles of the dispensers. About 50 percent of this area is above 6,000 feet in elevation and essentially all the 6-mile downwind area is above 4,500 feet. At least one-half of the augmented precipitation is expected to add to the snowpack of the Sierra Crest above 6,000 feet within this primary effect area. The remainder will add to the transitory snowpack between 6,000 to 4,000 feet.

Runoff in the Sierra Nevada is controlled by the temperature regime. The rate of meltwater production in years of average snowpacks is essentially independent of the amount of snow on the ground. A review of historical records indicates that snowpack contributions to extremes of streamflow are minimal. Recent studies suggest that extending the period of snowmelt (due to increased snowpack) does not cause a shift of the entire snowmelt hydrograph (MacDonald, 1986, 1987), but extends the duration of meltwater production. Increased snowpack in average to below average years is not expected to result in a material increase in peaks of major snowmelt floods.

Floods resulting from winter rains are a major concern in the upper basin. In this respect, the snowpack has a slight moderating influence on streamflow and, therefore, flood potential by delaying rain runoff. Rain-on-snow research conducted by Kattelman (1985, 1986(a), 1987) suggests that snow delays runoff from rain from a few to 12 hours. However, if weather modification resulted in a thin snow cover on ground that would have otherwise been bare, especially in the transitory zone below 1,828 m (6,000 feet), snowmelt during rainfall would lead to greater runoff than would have occurred naturally (Kattelman, 1986). The incremental increase in instantaneous runoff resulting from cloud seeding under these conditions would be slight. A runoff hazard could exist under the combination of record snowpack water content accumulation and a major rain-on-snow-event that included a substantial melt-off of the snowpack above 6,000 feet. Following the operating procedures outlined in the proposed suspension criteria, it is improbable that cloud seeding would add materially to the snowpack contributing to runoff in these rare events.

Rain-on-snow events, which are responsible for the highest peak flows, would be unaffected by changes in snowpack depth resulting from the proposed action. Suspension criteria incorporated into the project requires close integration of snowpack monitoring with cloud-seeding operations specifically to reduce the possibility of adding to the risk of floods. The risk of adding to local flooding is further minimized by requiring the curtailment of cloud-seeding activities during flash-flood warnings from the National Weather Service, and at the onset of excessive runoff conditions in the project area (or downstream), as determined by DWR Flood Forecasting.

8. Water Use

The project will not affect the patterns or rates of use of water resources in the project area. The primary area-wide 5 percent or less additional precipitation will provide additional water infiltration and runoff. This water will follow the natural hydrologic drainage system, spreading its benefits among all water users. As a result of this project, additional water moving from the upper Middle Fork Feather River drainage downstream to Oroville Reservoir will add to streamflow and downstream beneficial uses.

"In-basin" or area of origin uses are protected by State water laws. The relevant area of origin laws do not give the counties a right to compensation for water supplies developed within the counties or for water supplies that originate as precipitation in their counties. The County of Origin Law, Water Code Section 10505, provides that the State Water Resources Control Board shall not approve a priority in appropriation of water under a State filing that would deprive the county in which the water originates of any water necessary for the development of the

county. This means that if a project appropriates water under a State filing within the county for delivery for use outside the county, the project will be subject to having other appropriations made later with a higher priority if they would provide water necessary for development of the county.

The Watershed of Origin Law, Water Code Section 11460 - 11465, provides that the water rights of the Department of Water Resources are subject to being diminished by later water developments that would serve beneficial uses in the watershed where the water originates or in immediately adjacent areas. Alternatively, people in the watershed of origin or the immediate adjacent areas could purchase water from the State Water Project with a priority higher than water contractors outside the watershed of origin.

The purpose of both laws is to allow water projects to be developed in the local area to serve local needs despite the existence of projects developed earlier by the State in the area to supply water needs in other areas. Neither law contemplates payments to the counties for the water.

9. Downwind Precipitation Depletion

The most common public belief about cloud seeding is that it is an exercise in "robbing Peter to pay Paul", wherein it is feared that increased moisture for point A from cloud seeding must come from a point B. Though plausible, two major studies present evidence this is not the case.

Water vapor is a natural component of air. When the vapor becomes sufficiently dense, it forms minute water droplets and becomes visible as clouds. When these clouds are acted upon by natural forces such as the vertical upward motion that occurs as they are lifted over a high mountain range like the Sierra-Nevada Mountain Range, their cloud temperature decreases causing some of the water vapor they contain to condense and form minute water droplets. These droplets can grow in size until they become big enough or heavy enough to fall to earth as rain or snow. Scientists estimate that only 10 percent or less of the moisture in most storm systems is extracted in the precipitation process. As not all of the droplets grow to the size needed to fall as precipitation before they pass over the mountain crest, these minute water droplets are lost to the precipitation process. As the air mass passes the crest, it sinks in elevation to where the temperature is warmer. This warmer temperature, though minor, permits the minute water droplets to return to water vapor through the process of evaporation. This stops or reduces the precipitation process and creates a "rain shadow" effect. Cloud seeding attempts to make a storm cloud more efficient in precipitating its minute water-droplets by artificially inducing them to grow in size to precipitate as snow or rain before they leave the area.

The role of natural atmospheric disturbances in causing the convergence and ascent of moist air is the dominant mechanism that makes moisture available for cloud formation and precipitation.

As the storm front and air mass continues moving downwind, it will be mixed and equalized with the remaining water vapor or with other natural sources involved in the weather fronts affecting the area.

The storm front and air mass will continue moving downwind until it meets another mountain range where it will repeat the condensation cycle. (Detection of Downwind Effects of Seeding National Oceanic and Atmospheric Administration Environment Research Laboratories, 1974)

In 1975, the U. S. Bureau of Reclamation Division of Atmospheric Water Resource Management Group published a document reporting 9 years of study of large-scale effects of cloud seeding. The report concluded that after a 9-year study of cloud seeding winter storms, the scientists were unable to find any evidence that supported the theory that stimulation of precipitation in one area deprived another area. However, they did find evidence suggesting that cloud seeding may strengthen existing natural precipitation systems from 90 to 125 miles downwind from the seeding source.

These studies indicate that this proposed project of cloud seeding of cold, winter storms will not have a depletable effect on precipitation downwind of the seeding area.

G. Erosion

The Middle Fork Feather River drainage can be divided into two areas of marked erosional differences. The area in the southwest of the Middle Fork Feather River contains watersheds primarily in stable condition. Watersheds in the northeast which are out of the primary project area, are generally less stable and can reflect accelerated erosion.

Weather modification in the Middle Fork Feather River drainage would increase the snowpack and its water content and rainfall at lower elevations, resulting in additional streamflow. Each of these effects has raised concerns about their impacts on erosion and potential cumulative impacts in the prototype project area.

1. Snowpack Augmentation

The effects of snowpack augmentation on weathering, nivation, mass wasting, and surface erosion within the American River Basin

were assessed by Kattelman (1986(b)). General conclusions based on assumed snowpack increases from 5 to 10 percent annually only in years of normal or subnormal snowfall were:

- (1) The rate of meltwater production in years of average snowpacks is essentially independent of the amount of snow on the ground.
- (2) The warm, winter storms that cause rain-on-snow events are responsible for the highest peak flows and occasional mass movements.
- (3) Meltwater production is unaffected by changes in snowpack depth.

Provided that adequate monitoring of the snowpack takes place to prevent buildup past a critical point, snowpack augmentation at the higher elevations is not expected to result in material increases in peaks of major snowmelt floods. The criteria that have been adopted for operation of the weather modification program would halt cloud seeding when it was evident that a rain-on-snow event would occur. Even then, the effect of such an event would be a sustained high flow--not an increased peak. Snowpack augmentation is beneficial by providing more storage (a "sponge" effect) for rainfall and by reducing massive flood releases from naturally occurring rain-on-snow storms.

Only in the transient snow zone would small changes in snowpack depth affect erosion processes. Here, if weather modification resulted in a thin snow cover on ground that would otherwise have been bare, snowmelt during rainfall would lead to greater runoff than would have occurred naturally. Conversely, the shallow snow cover made possible by weather modification would protect the soil from raindrop impact and minimize surface erosion. With the exception of the low elevation zone, the snowpack appears to have relatively little effect on geomorphic processes when compared to soil characteristics, topography, and vegetation.

Consistent with these findings, there would be no measurable direct effect on erosion from an augmented snowpack within the project area.

2. Rainfall

An increase in rainfall at lower elevations presents a potential erosion effect from weather modification. When bare soils are exposed or highly erodible soils are disturbed, raindrop impact detaches sediment. Overland flow, which accumulates quickly, carries the detached sediment to streams. Precipitation would fall predominately as rain on land surfaces within the project area below 4,500 feet. The expected average increase of .01 inch in precipitation per hour on these lower elevation lands is not expected to add significantly to rain impact erosion.

3. Streams

Increased streamflow will increase sediment transport in channels as additional water flowing downhill does additional scouring. Snowpack augmentation should have little or no effect on stream velocity; therefore, increases in sediment transport should be minor, and at worst, roughly proportional to the increase in streamflow.

This proposed prototype weather modification project is designed to seed only cold winter storms to increase the snowpack and benefit from the snowpacks slower release of water to runoff. It is not designed, nor will it be operated, to increase rainfall with its attendant problems of immediate runoff, especially on erosion.

4. Potential Cumulative Effects

The proposed prototype project is expected to have no discernable direct impact on erosion. Changes in the amount, intensity, and duration of snowfall resulting from cloud seeding, conducted under the restraints of randomization and project suspension criteria, are expected to be well within the range of natural variation.

A direct relationship exists between streamflow velocity and sediment transport. Very high flows result in the most serious sediment and turbidity problems due to increased erosion. The cumulative effects of erosion are usually concentrated in streams. Varying degrees of stream bank erosion attest to the inability of streams to adjust to a system that has changed too quickly to maintain its integrity. Additional sediment and runoff that a stream channel can carry before damage begins to occur varies for a given stream or reach of stream. At each there is a threshold of stability. When the threshold is exceeded, landslides, channel aggradation or degradation, and bank erosion may occur.

Natural erosion and runoff rates can increase exponentially in areas disturbed by excessive land-use activities. That is, an increase in streamflow may be accompanied by a massive increase in sediment load, where sediment is available (Leopold, 1981). Roads, logging, grazing, fires, and other factors collectively interact with soil erodibility, slope stability, and the region's climate and hydrology to cause events of accelerated erosion. Natural annual variability in runoff masks any impacts that may be associated with cloud seeding. The potential errors in estimates of erosion and sediment yield are much greater than any predicted increases in runoff due to cloud seeding (USCE - 1989). The effect of additional runoff due to augmented snowpack cannot be assessed independent of human-related land-use impacts within individual watersheds.

The additive erosional effect within the upper Middle Fork Feather River drainage directly attributable to the proposed project is limited by the project's extent and duration, the relative stability within the primary enhancement area, and a lack of contribution to peak flows. Enhanced runoff during below normal to normal years will not significantly increase erosion within the project watershed.

The Department, in cooperation with the Plumas National Forest, will develop a monitoring program to assess the potential for cumulative effects of erosion and contribution of stream flows to sediment transport. Areas representative of the different types of disturbance contributing to water quality degradation will be monitored.

H. Water Quality

Water quality data in the project area needs to be updated and expanded. The Middle Fork Feather River is known to have degraded quality water conditions due to urban and agricultural pollution. Dilution, primarily by water entering from Nelson Creek, does reduce the problem to acceptable levels through the wild portion of the Wild and Scenic River. Streams are deteriorated during heavy runoff by sediment, and also in late summer when there are lower, warmer flows. Some streams are also degraded by mine drainage and wastewater discharge from private lands, primarily from Sierra Valley and the communities of Portola and Dellaker.

Three areas of concern regarding the potential relationship between weather modification and potential stream pollution within the American River basin were evaluated in the Fourth Sierra Ecology Project Workshop. The three areas reported on were: (1) the modification of inputs to the watershed including particulate matter, macro-nutrients, heavy metals, and other constituents; (2) changes in the movement and overall quantity of water; and (3) alteration of particulate matter, macro-nutrient, heavy metal, and other constituent outputs from the watershed. The report concluded that, based on an assumed 10-percent increase in precipitation, none of these areas would be altered in a significant manner. The Sierra Cooperative Pilot Project Environmental Assessment citing these studies concluded that, consistent with the Project Skywater programmatic FEIS, there would be no impact on water quality from weather modification activities.

The same conclusion of no impact on water quality holds for the proposed project as long as there is no significant increase in erosion rates within project watersheds (discussed under previous heading).

It has been suggested by Kattelman (1986) that the primary impact of snowpack augmentations would probably be on chemical weathering and solute transport. Additional water in the soil should allow increased solution and leaching of minerals. The amount of increase

over natural levels could be as high as the increase in water. However, the concentration of the dissolved level in streams should remain relatively constant with only total load and water quantity elevated.

As there is limited baseline data for the streams in the project area, the Department will initiate a water quality baseline study in consultation with the Plumas National Forest, California Department of Fish and Game, and the State Regional Water Resources Control Board.

I. Plant Communities

Weather modification effects on forest vegetation, herbaceous plants, and grasses have been studied extensively in the San Juan Ecology Project, Medicine Bow Ecology Project, and the Sierra Ecology Project. These studies are summarized in the Project Skywater FEIS. Researchers addressed the potential impacts of increased precipitation, snow accumulation, soil moisture, and delayed snowmelt on various ecological components including:

1. Primary productivity
2. Catastrophic events
3. Water stress
4. Successional processes
5. Phenological activity
6. Growth and biomass
7. Insects and disease
8. "Thinning" from years of subnormal precipitation (reducing drought stress)
9. Plant community composition
10. Growth cycles, seed germination
11. Rare and endangered plants

From a review of these works, it can be concluded that winter snowpack augmentation would potentially have its greatest effect on decreased drought effect (weeding-out), wet meadows, and plants growing at the extreme limits of their tolerance range for water. The multi-agency Environmental Monitoring Systems (EMS) workshops which set the framework for environmental monitoring in the SSCP study area concluded that environmental change attributed to a 10-15 percent increase in annual precipitation over a 5- to 7-year period would be unlikely, and difficult to detect.

There is no evidence to indicate that operation of the prototype project over a 5-year period would cause any discernible change in vegetation in the project area.

However, the EMS workshop focused research and monitoring on "sensitive" botanic and hydrologic microenvironments most likely to concentrate and amplify increased snowmelt and snowpack effects. Phytosociological and phenological investigations (Nachlinger, 1985), that resulted from EMS recommendations, revealed that snow is a primary factor controlling subalpine meadow vegetation and is likely the principal element controlling plant development and reproductive success in subalpine meadow taxa. Although increases in snowpack over a limited number of years would not be expected to cause any significant change in subalpine meadow ecology, prolonged application of winter snowpack augmentation could have both beneficial and deleterious consequences. Evaluation of a cloud-seeding program of indefinite duration would require a study of potential long-term effects on alpine meadows.

J. Rare Plants

A list of "sensitive" plants (species considered to be rare, endangered, threatened, sensitive, or of special interest by various agencies) was compiled from California Native Plant Society (CNPS), California Natural Diversity Data Base (CNDDB), and Plumas National Forest (USFS) sensitive plant lists. Forty-two of these "sensitive" species were found to have a potential for occurrence in the area affected by the weather modification project.

These species are listed in Appendices E, with their status and habitat requirements according to USFWS, CNPS, CDFG, and USFS.

Known sites of seven of the "sensitive" plants in the area are on file at the Plumas National Forest Supervisor's Office in Quincy. Appendix E contains a description of each species' habitat and blooming period. Some of these plants have very narrow ranges, such as Arabis constancei, which is found only in Plumas County, or specific habitat requirements such as Silene invisa, which grows only at edges of meadows with specific moisture regimes.

Eight species grow in habitats potentially occurring on mountain peaks and ridges of at least 6,500 feet in elevation, where propane tank siting could directly impact them: Arabis constancei, Polystichum lonchitis, Silene invisa, Carex paucifructus, Draba stenoloba var. ramosa, Erigeron miser, Polystichum kruckebergii, and Veronica cusickii. The remaining species occur in a variety of habitats which may be located in the area of influence. Of special concern are plants that grow in the margins of meadows or creeks or in dry meadows where a change in the hydrology of the area may change the habitat.

In the 1988 field season, a "sensitive" plant species survey was conducted on peak and ridge sites chosen for placement of dispensers.

No sensitive plant populations were identified at the ten possible dispenser sites. Any potential impacts to sensitive plant populations that arise from dispenser or precipitation gauge siting will be mitigated by relocation of the equipment to another site acceptable to USFS personnel.

Plant species with extremely limited habitats, including narrow tolerance to soil moisture regimes, may be effected by precipitation augmentation programs that increased soil moisture levels or snowpack duration. The proposed project will augment precipitation during below normal years, while maintaining precipitation within the normal range of variation. Since precipitation will not be altered from the normal range, sensitive plant populations within the project area are not expected to change. Monitoring of plant populations will be developed in conjunction with the Plumas National Forest.

K. Wildlife

Various weather components may influence the daily and seasonal activities of many wildlife species (Grensten and Ryerson, 1973 - Montana State University, "Ecological, Wildlife and Biocommunities", Section 2). Based on the conclusions of the San Juan Ecology Project, Medicine Bow Ecology Project, Sierra Ecology Project, and consistent with the Sierra Cooperative Pilot Program EA-FONSI, the proposed 5-year prototype project to augment the snowpack by cloud seeding would result in:

1. A slight increase in forage growth.
2. No measureable change in vegetation "life zones".
3. A slightly extended growing season.
4. Less drought impact to summer range.
5. Little or no effect on fall ranges.
6. No material impact on deer predators.
7. A general benefit to a potential negative impact to deer and their habitat, depending on the effects of other human activities (primarily grazing, wildfires, and controlled burning) in the upper Middle Fork Feather River drainage.
8. A slight benefit to small burrowing animals, but no discernible impact on small mammal populations, range, or diversity.
9. No impact to regional bird populations or their habitat.

L. Fish and Aquatic Life

Sierra Ecology Project Workshops IV and V and the Medicine Bow Ecology Project investigations of potential effects on fish and aquatic life are summarized in the Skywater FEIS.

These studies concluded that precipitation increases of up to 10 percent will have an imperceptible change on trout in high elevation streams and that no discernible change will occur in fishery management of lakes and streams in the midelevation and lower elevation ranges. Stream temperatures at higher elevations will remain lower for the period of extended snowmelt but will not be as pronounced at lower elevations.

Also, these studies concluded that increased snowfall and rain amounts resulting from the proposed project is of minor importance to the aquatic ecosystem and will not initiate winterkill in lakes at elevations below existing winterkill locations nor adversely impact warmwater fish or trout.

There is a limited amount of fishery data from the Middle Fork of the Feather River and its tributaries in the project impact area. What data are available indicate that present flow, temperature regimes, and overall ecological conditions favor fish production in a number of the tributaries as well as the Middle Fork Feather River. Some of the tributaries that have higher sustained flow throughout the year are recognized as having some of the better fisheries in the Feather River Basin.

Zooplankton and phytoplankton species are not expected to change, but numbers may change as a result of water temperature change. Any change would be subtle and defy detection in all but an extended monitoring system.

Streamflows in the project area are subject to vast natural changes affecting the benthic invertebrates in the stream. Due to the lack of knowledge about the effects of streamflow extremes, other natural or man-induced factors could mask and make impossible a determination of any effects that might be attributed to a snowpack augmentation program.

It is believed that the slightly increased or higher sustained runoff occurring from snowpack augmentation will not have an adverse or significant effect on the fisheries in the streams in the project-impact area. Conversely, the Department believes there would be a definite benefit to the fishery from the sustained flows of runoff originating from the augmented snowpack.

Nevertheless, the Department will undertake assessments of the fishery habitat in selected streams in the project area, with special emphasis on Nelson Creek. These assessments will be coordinated with PNF and DFG and will focus on trout. Also, they will provide baseline data on fishery habitat, aquatic benthos, and water quality (see Appendix C).

M. Endangered and Threatened Animals

A list of species considered to be endangered, threatened, sensitive, or of special interest by various agencies was compiled from the

California Natural Diversity Data Base and Plumas National Forest species lists. The following tabulation lists these species with their status according to the U.S. Fish and Wildlife Service, California Department of Fish and Game, and U.S. Forest Service.

<u>Species</u>	<u>Listing</u>	<u>Status</u>
Bald Eagle	U.S.-Endangered, State-Endangered	
Golden Eagle	U.S.-Sensitive, State-Special concern, protected	
Prairie Falcon	State-Special concern	
Northern Goshawk	U.S.-Sensitive, State-Special concern	
Spotted Owl	U.S.-Sensitive, State-Special concern	
Short-Eared Owl	State-Special concern	
Willow Flycatcher	U. S.-Sensitive, State-Special concern	
Sierra Nevada Red Fox	U.S.-Candidate, State-Threatened	

Two bald-eagle-nesting territories exist near Lake Davis and one at Antelope Lake. The golden eagle, prairie falcon, northern goshawk, spotted owl, short-eared owl, willow flycatcher, and pine martin also maintain territories or may occur within the project area. The proposed winter snowpack augmentation program will not affect these species directly, or significantly alter their habitats or food supplies.

N. Cultural Resources

The Plumas National Forest Cultural Resource Management Program has inventoried, evaluated, and protected or enhanced the cultural resources thus far located within the Plumas National Forest as required by law or administrative directories (Plumas National Forest Land and Resource Management Plan EIS - 1988). Though much of the inventory has been associated with resource management projects such as timber harvesting, present objectives are to complete an inventory of all cultural properties by 1995 and evaluate the suitability for including the identified sites in the National Register of Historic Places, as required in the American Indian Religious Freedom Act of 1978.

Presently, one prehistoric site in the project area is included on the National Register of Historic sites: the Lakes Basin petroglyphs.

Two lodges built in historic times (the Elwell Lodge and the Gold Lake Lodge) have been evaluated to be eligible for inclusion on the National Register. Both are located in the Lakes Basin area. The five-story high Eureka Gold Stamp Mill and the Jamison Mine Complex located within the Plumas-Eureka State Park are also included on the National Register of Historical Sites.

Plumas-Eureka State Park encompasses several homes dating from the 1870s. The Moriarty House has been converted to a house museum and

has been preserved and equipped with furnishings found during the 1890-1900 period. The park headquarters and museum are located in a former Sierra Buttes Mining Company bunkhouse.

The community of Johnsville, a "private holding" surrounded by Plumas-Eureka State Park, have homes that were built in the early part of the century. Many have been, or are being, restored to preserve their historic heritage and character.

These resources have weathered the natural, extreme ranges of measured snowfall on the area. The probable increase in snowfall resulting from the proposed project would not adversely affect these sites.

Exact dispenser locations were determined using helicopters equipped with LORAN (a navigational system based on pulsed radio signals from two pairs of ground stations of known position). Each site has been visited by an approved Forest Service archaeologist, and all final sites have been cleared by the USFS. Maps and documents, including those pertaining to the sites avoided, are recorded with the Plumas National Forest in Quincy. The same archaeologist will be present during installation to assure there will be no disturbance of previously undiscovered artifacts, and USFS personnel will inspect dispenser sites after placement to verify that cultural resources remain undisturbed.

0. Aesthetic Values

All of the ten potential sites for the dispensers are located in area allocated to semiprimitive management by the USFS. The Plumas National Forest Land and Resource Plan discussion for semiprimitive areas states that "the PNF can allow facilities in these areas only after an analysis determines that the essentially undisturbed character of the area can be retained." Similar direction exists on the Tahoe National Forest.

Five of the sites are in close proximity to the Pacific Crest Trail, a designated hiking trail running the length of California, Oregon, and Washington. Three of the dispensers are within or near the boundary of the Lakes Basin Recreation Area. The winter placement of propane tanks in these areas will slightly change the character of the areas.

A special effort will be made to locate the installations away from the hiking trail and be made as unobtrusive as possible without compromising the efficiency of the dispenser.

Tanks will be put in place by November and remain in place throughout the winter season until early spring when they will be removed. The tanks will be painted white and, therefore, less visible because of the white background created by snow conditions.

Towers and tanks will be held in place by steel-cable, guy wires attached to bolts that have been drilled into the rocks located

10-15 feet away. The bolts will remain in place permanently and, when not in use, will be hidden by a natural covering. The bolts will also mark the exact location for future installation of tanks during the study period.

However, the placement of permanent towers in Alternative 1 would require excavation of footings and construction of a concrete pad. The tower facilities under this alternative would remain in place year-round and would create a visual impairment to summer recreationists. The site would then not meet the VQO of "retention".

The "no action" alternative will not disturb the area, and it would be maintained in its existing semi-primitive status.

P. Transportation

Snowfall affects highway use, safety, and maintenance as well as rail transportation in the project area. The snowpack augmentation program is not expected to create heavy snowfall, but to cause a small increase (up to 10 percent) in snowfall. Such an increase would probably have a negligible effect on road or rail travel (James Brock, Plumas County Road Supervisor, pers. comm.).

The California Department of Transportation maintains State Highways 70, 89, and Gold Lake Highway. The Gold Lake Highway is not maintained in winter time following the first major snow storm.

Plumas County maintains all other thoroughfares and roads in the project area except in the City of Portola, which maintains its own roads. Every winter, Plumas County assigns snow-removal equipment which is permanently stationed and used in the project area.

Both the California Highway Patrol and the California Department of Transportation (Caltrans) studied the potential impacts of weather modification and increased snowpack (up to 15 percent in normal or below normal years) in the Sierra Nevada.

The Caltrans study states: "There is little direct relationship to increased costs for small incremental changes in storm size. This is because the amount of equipment and manpower necessary to maintain a traversable roadway under frost conditions, or handle the problems of freeze-thaw of snowbanks adjacent to the roadway which cause icy conditions." The report stated that road closures are more frequently caused by blowing and drifting snow or icing conditions rather than the amount of snowfall. The projected snow increases from a proposed weather modification project should not affect emergency operations to any significant degree over that caused by normal storm action.

However, the Department has agreed with Plumas County and the City of Portola to compensate them for any additional snow removal costs that could be assumed to result from the operation of this snowpack augmentation project.

Two of the ten dispensers, Nos. 6 and 10, are located on the Tahoe National Forest land in Sierra County. Dispenser No. 6 is located in a remote, roadless area approximately 1 mile south of the Sierra crest on a peak higher than the Sierra crest. It is believed that any ice crystals created from clouding seeding will be rapidly carried over the crest and have no measurable impact on the area located in Sierra County. Runoff from any snowpack augmentation in this less than 1 square mile of impact area will drain into Spencer Lake and eventually into the Yuba River.

Dispenser No. 10 is also located on a peak approximately 1 mile south of the Sierra crest between Lower Salmon and Deer Lake. Though not as remote as site No. 6, it is in an area where roads are closed and not maintained during winter months. There are cabins in the area of impact, but they are not generally occupied during the winter months. Runoff from snowpack augmentation from this dispenser that impacts Sierra County will flow mostly to the Feather River, except for a small amount that will drain to Salmon Creek and to the Yuba River.

The impact on Sierra County will be almost immeasurable as the snowflake-ice nuclei created by releases from the two dispensers will be rapidly carried downwind by the winter storm, leaving Sierra County before they can form and fall as snow.

Q. Safety

1. Floods and Avalanches

Suspension criteria incorporated into the proposed project is designed to minimize risk to the health and safety of local and downstream residents (See discussion on page 25). The criteria provide for the suspension of cloud-seeding activities during anticipated, possible flood conditions or avalanche occurrence that may affect public safety.

2. Hazardous Material Spill Contingency Plan

The California State Health and Safety Code requires any business or agency that uses or stores a hazardous material to file a Hazardous Material Spill Contingency Plan. In case of an emergency when hazardous material is released or threatens to be released, the plan is to be implemented. The plan is to be filed with the appropriate county agency, in this case, the Plumas and Sierra Counties' Environmental Health Officer. It must also conform to the standards adopted by the California State Office of Emergency Services.

A hazardous material is defined as any material because of its quantity, concentration, physical, or chemical characteristics poses a significant present or potential hazard to human health and safety or the environment if released into the workplace or environment.

Propane is classified as a hazardous material. The Hazardous Material Spill Contingency Plan for this project is being prepared and will be filed with the appropriate agencies once the U. S. Forest Service issues use permits for the prototype project.

3. Fire Hazard

The most obvious hazards associated with a propane-dispensing or burning systems are explosion and fire. The possibility of explosion, however, is extremely remote. A propane-air mixture is explosive only if the concentration of propane exists in proportions of 2 to 10 percent. Such high concentrations of propane exist over a very small region about the nozzle (approximately 5 feet vertically, and no farther than 7 feet downwind horizontally). Thus, except for the possibility of leaks at ground level, the only potential area of explosion is immediately downwind of the nozzle--15 feet above the ground. Introduction of a spark or flame into this area will ignite the propane plume, resulting in the formation of a harmless torch.

The previously mentioned U. S. Air Force tests demonstrated that an unprotected propane plume will not remain ignited in wind speeds greater than 4 knots (wind speeds greater than 20 knots are expected at the mountain top). There is sufficient natural clearing around each site so the wind would not carry the flame into vegetation.

It is not expected that the windy locations of the dispensers on the high mountain ridges will permit any leaking propane to accumulate in concentrations sufficient to pose a fire hazard nor will it reconstitute under the stated conditions. (See year-end report, Project RD 6, Civil Engineering Research Division, Directorate of Engineering and Construction, Deputy Chief of Staff/Civil Engineering, Headquarters Alaskan Air Command.) However, the Department recognizes there could be an exception; all personnel operating and maintaining the propane dispensing equipment will be instructed in safe procedures, especially not to smoke in the vicinity of the tanks. Routine maintenance procedures will be conducted when the tanks are accessible and warning signs will be posted on and around the tanks.

Propane distributors who place propane tanks in remote areas have reported numerous attempts by vandals to shoot holes in these propane tanks. Since the tanks are made of thick plates of steel, all distributors, except for one, reported that the attempts were unsuccessful. The one incident where it was successful was by someone firing a special armor-piercing type of projectile from a high-powered rifle. Though all of the propane was released through the entry hole, the tank did not explode nor did it catch on fire.

Lightning strikes on propane tanks are a possibility and occasionally occurs. Each tank is grounded in a manner that when a strike occurs, the release valves automatically close shutting off the release of propane.

State, local, and USFS-approved fire prevention measures will be used in handling the propane. The Fire Hazard Response Plan is being prepared and will be filed with the appropriate agencies once PNF issues use permits for the project.

R. Regulation and Consistency with Other Planning Documents

1. Regulation

State law requires that weather modification sponsors let people know what they plan to do and file a report on what they did afterwards. The notification requirements consist of a legal Notice of Intention published once every 5 years and an annual statement or notice to the board of supervisors of each county that may be affected. Reports are to be made within a year after a project ends or, in the case of ongoing projects, a biennial report.

2. Plans and Zoning

The proposed action does not conflict with the Plumas National Forest or Tahoe National Forest Land and Resources Management Plan as presented in their respective Environmental Impact Statements.

Both Plumas and Sierra Counties have adopted a General Plan incorporating all of the elements required by Government Code Section 65300, et al. Any proposed land use within the counties must be compared with this General Plan to determine if the proposed use is consistent with the basic land use designation and does not adversely affect an overlying constraint.

The EIS/EIR document discusses the effects the project will have on the appropriate elements. Those elements affected are portions of: (1) scenic areas, (2) noise, (3) safety, and (4) conservation.

The report concludes that there will be no significant impact on any of the elements that cannot be mitigated.

The State is not subject to complying with requirements for use permits issued by the County. However, to assure the County that the State is willing to comply to their General Plan element requirements as far as is reasonable and to keep the County fully informed as to the Department's activities within their jurisdiction, the Department will supply to the County all the information required on the use permit application forms.

The Department will also reimburse the counties for their review and filing of the information. In doing so, the Department is not waiving any immunities it may have as a matter of law of not consenting to any local jurisdiction beyond that required by law.

V. CONSULTATION AND COORDINATION

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This environmental assessment was prepared by the California Department of Water Resources, Northern District, Environmental Studies Section, Red Bluff, California, in coordination with the Plumas National Forest, Supervisors Office, Quincy, California, and the U.S. Bureau of Reclamation's Atmospheric Resources Research, Denver, Colorado.

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Project Design - David Reynolds, Head of Sierra Nevada Project
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Coordination of the document with the U. S. Forest Service was with Carl Summerfield, Planning Officer (Ret.), Plumas National Forest; R. Courtland Bennett, Forest Planner, Plumas National Forest.

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 Plumas County Planning Director, Quincy
 Plumas County Road Department, Quincy
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APPENDIX A

**MIDDLE FORK FEATHER RIVER SNOWPACK
AUGMENTATION PROPANE DISPENSER LOCATION
MAPS AND SITE DESCRIPTIONS**

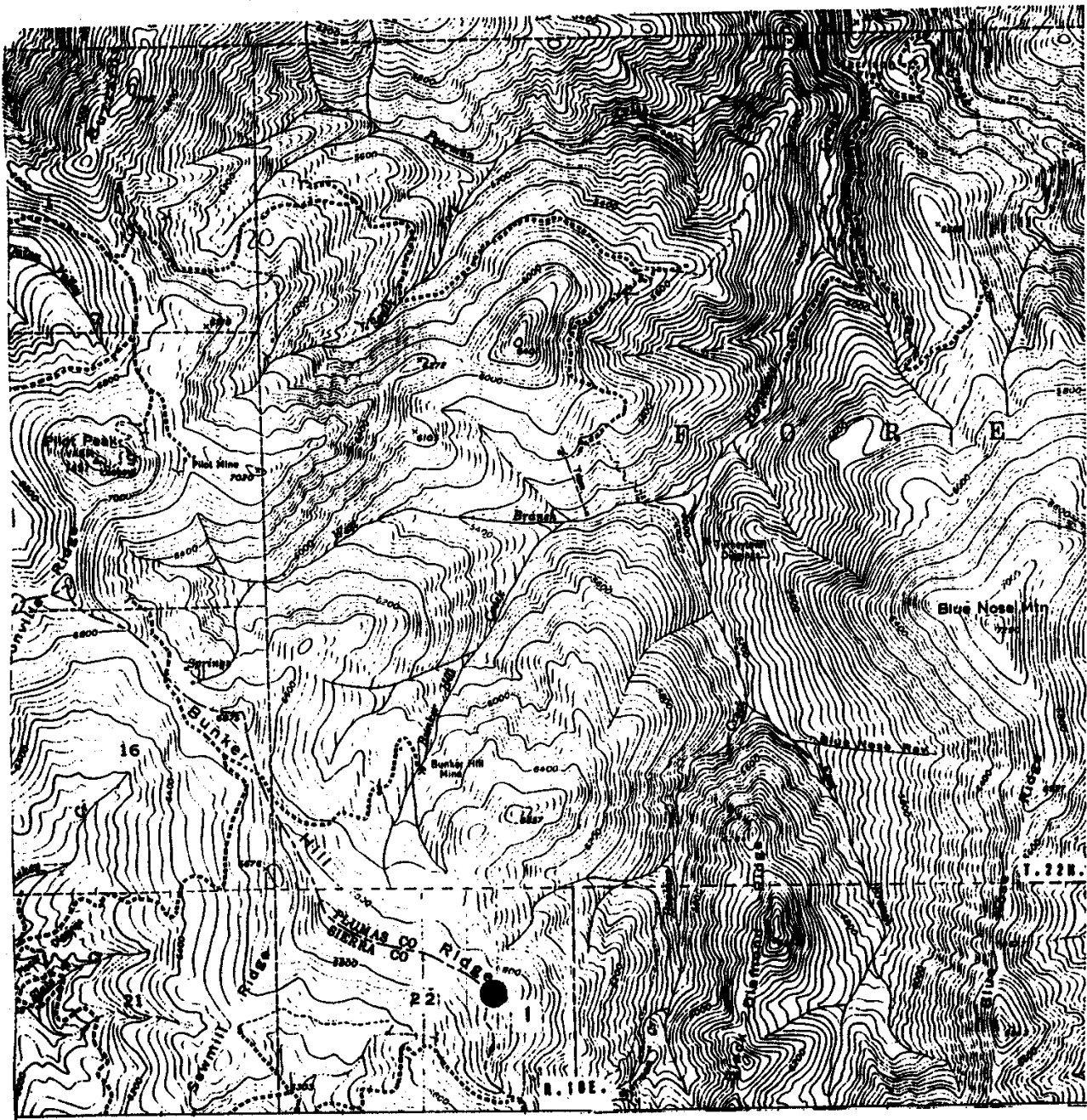
APPENDIX A

MIDDLE FORK FEATHER RIVER SNOWPACK AUGMENTATION PROPANE DISPENSER LOCATION MAPS AND SITE DESCRIPTION

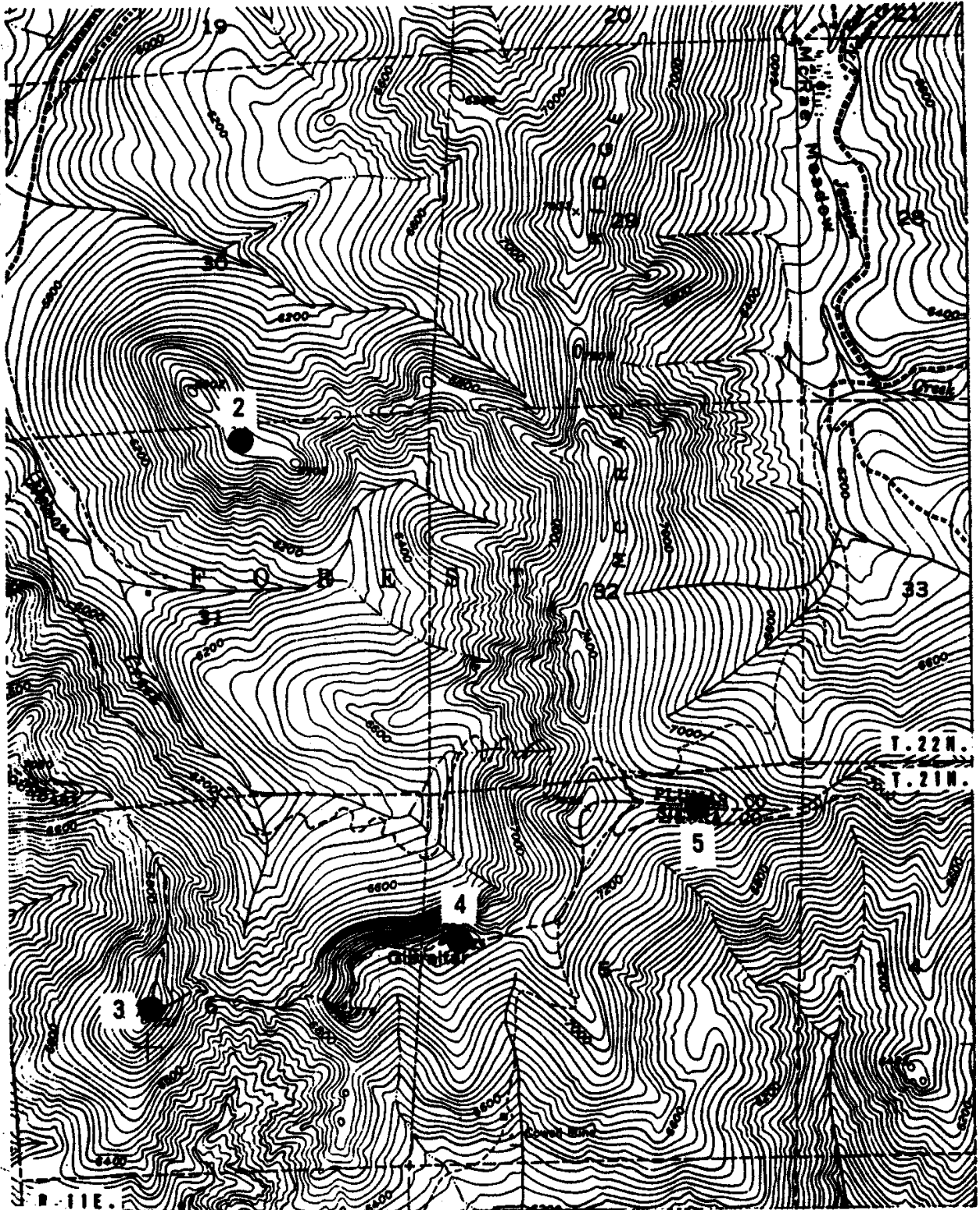
<u>Station</u>	<u>Location</u>	<u>Remarks</u>
1	T22N-R10E-Sec 22 SW 1/4 - NE 1/4	Approximate elevation - 7,000 ft., on crest of ridge approximately 300 feet up gradient from Pacific Crest Trail. The area has a USFS roaded natural recreational opportunity spectrum, with modification of visual quality objectives. Archeological survey found no cultural remains. Based on vegetation surveys, no sensitive plants have been identified.
2	T22N-R11E-Sec 31 NW 1/4 - NE 1/4	Approximate elevation - 6,900 ft., on SE crest of unnamed peak approximately 1-1/2 mile N of Gibraltar Peak--approximately 1 mile N of Pacific Crest Trail - in USFS semi-primitive area recreational opportunity spectrum, with retention of visual quality objectives. Archeological survey found no cultural remains. Vegetation surveys have not identified any sensitive plants.
3	T21N-R11E-Sec 6 NE 1/4 - SW 1/4	Approximate elevation - 7,100 ft., on crest of unnamed peak approximately 3/4 mile west of Gibraltar Peak and approximately 1/2 mile west and upslope of Pacific Crest Trail. In USFS semi-primitive area recreational opportunity spectrum, with retention of visual quality objectives. Archeological survey found no cultural remains. Vegetation surveys have not identified any sensitive plants.
4	T21N-R11E-Sec 5 SW 1/4 - NW 1/4	Approximate elevation - 7,300 ft., on crest of Gibraltar peak approximately 1/4 mile upslope from Pacific Crest Trail in USFS semi-primitive area recreational opportunity spectrum, with retention of visual quality objectives. Archeological survey found no cultural remains. Vegetation surveys have not identified any sensitive plants.

<u>Station</u>	<u>Location</u>	<u>Remarks</u>
5	T21N-R11E-Sec 5 NW 1/4 - NE 1/4	Approximate elevation - 7,300 ft., on crest of Sierra ridge approximately 200 ft upslope of Sierra Crest Trail in USFS roaded natural recreational opportunity spectrum, with partial retention of visual quality objectives. Archeological survey found no cultural remains. Vegetation surveys found no sensitive plants.
6	T21N-R11E-Sec 10 SE 1/4 - NE 1/4	Approximate elevation - 7,200 ft., on unnamed crest of peak approximately 1/4 mile south of Spencer Lakes. In Tahoe National Forest in USFS semi-primitive motorized area with retention of visual quality. Archeological survey found no cultural remains. Vegetation surveys found no sensitive plants.
7	T21N-R11E-Sec 2 SE 1/4 - SW 1/4	Approximate elevation - 7,300 ft., on N side of crest of ridge that is also National Forest boundary and south boundary of Lakes Basin Recreation Area. Approximately 1/2 mile south of Wades Lake and approximately 1/4 mile from Pacific Crest Trail. In USFS semi-primitive area with retention of visual quality. Archeological survey found no cultural remains. Vegetation surveys found no sensitive plants.
8	T21N-R11E-Sec 13 SW 1/4 - NE 1/4	Approximate elevation - 7,500 ft., located on crest of ridge that forms National Forest boundary and south boundary of Lakes Basin Recreation Area. Approximately 1/2 mile west of Round Lake and approximately 500 ft. upslope from Pacific Crest Trail in USFS semi-primitive non-motorized area with retention of visual quality. Archeological survey found one flake but no other cultural remains. Vegetation surveys found no sensitive plants.

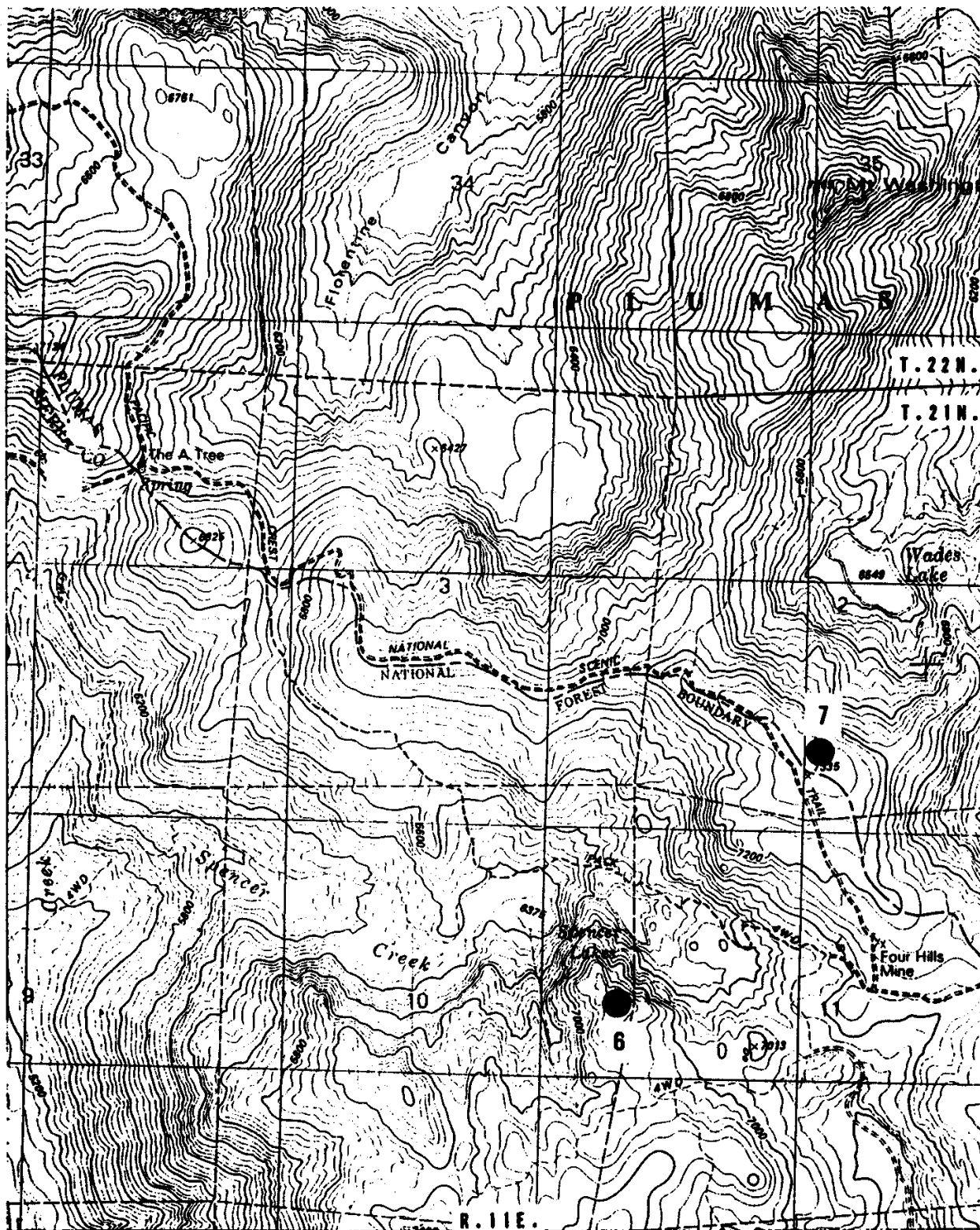
<u>Station</u>	<u>Location</u>	<u>Remarks</u>
9	T21N-R12E-Sec 18 SW 1/4 - NE 1/4	Approximate elevation - 7,000 ft., located on the west end of unnamed ridge on the Plumas County line inside Lakes Basin Recreation Area, between Round Lake and Gold Lake. Approximately 1 mile from Pacific Crest Trail in USFS semi-primitive non-motorized area with retention of visual quality. An archeological survey shows an ancient quarry and occupation site on this hill. The site was moved westward and upslope to an area where no flakes or midden were evident. If further archeological observation during installation of the dispensers show the site to be still unsatisfactory, it will be dropped from the preferred dispenser sites. A vegetation survey found no sensitive plants.
10	T21N-R12E-Sec 29 SE 1/4 - SW 1/4	Approximate elevation 7,200 ft., located on the crest of an unnamed peak in Sierra County, midway between Deer Lake and Lower Salmon Lake in the Tahoe National Forest, approximately 1/4 mile upslope from Pacific Crest Trail. It is located in USFS semi-primitive, motorized area with retention of visual objective. An archeological survey shows no cultural resources were evident. A vegetative survey found no sensitive plants.



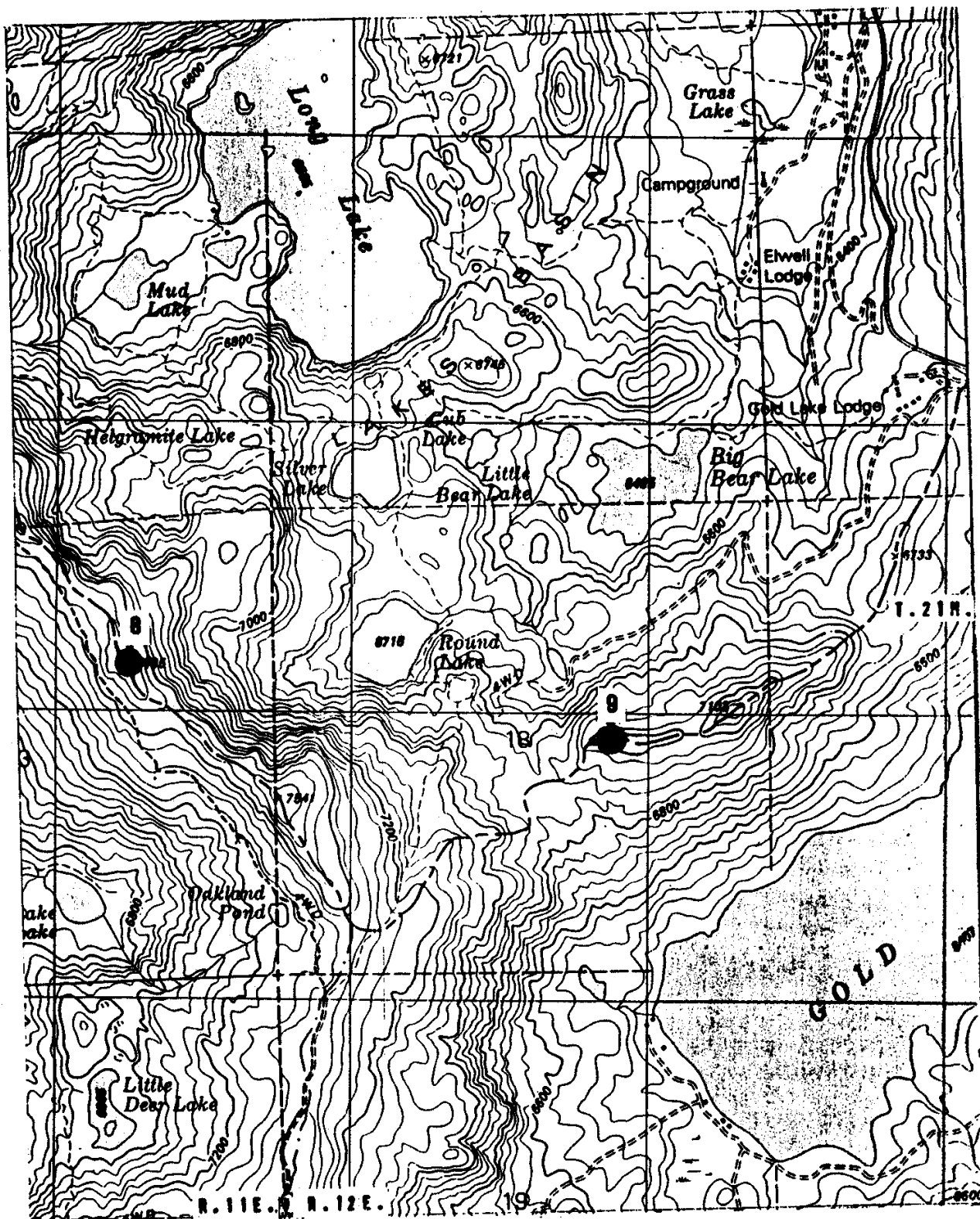
PROPANE DISPENSER LOCATIONS



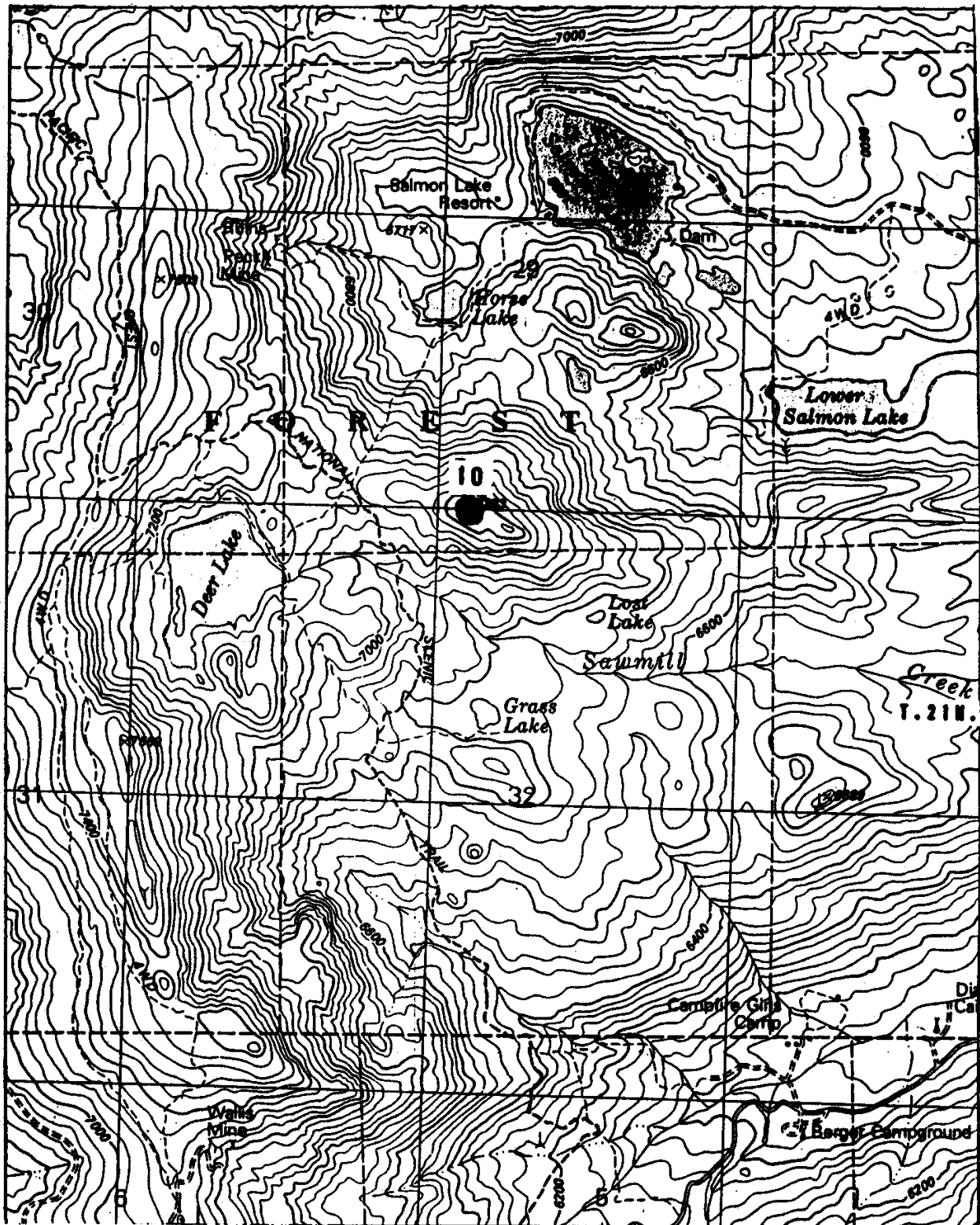
PROPANE DISPENSER LOCATIONS



PROPANE DISPENSER LOCATIONS



PROPANE DISPENSER LOCATIONS



PROPANE DISPENSER LOCATIONS

APPENDIX B

**MIDDLE FORK FEATHER RIVER SNOWPACK AUGMENTATION
AUTOMATIC MEASURING PRECIPITATION GAUGE
SITE DESCRIPTIONS**

APPENDIX B

MIDDLE FORK FEATHAER RIVER SNOWPACK AUGMENTATION AUTOMATIC MEASURING PRECIPITATION GAUGE SITE DESCRIPTIONS

Description of Precipitation Gauge Locations

A number of precipitation gauges are needed in the target area to measure the effectiveness of the prototype cloud-seeding project designed to enhance runoff to the Lake Oroville Reservoir.

The gauges that will be installed will convert all precipitation to liquid, measure it, and transmit the measurement on demand by radio to the Sacramento operations center.

Area coverage of the target area is essential as is the correct unobstructed exposure of the gauge to ensure that representative samples are collected. Thus, it may be found that some of these gauges may have to be moved to nearby better, more effective locations as the program progresses.

<u>Station</u>	<u>Location</u>	<u>Remarks</u>
1	T22N-R11E-Sec 24 SE 1/4 - NW 1/4	Located on Plumas-Eureka State Park property adjacent to existing non-automatic recording gauge. Approximate elevation - 5,200± ft.
2	T22N-R13E-Sec 28 SW 1/4 - SW 1/4	Located on land owned by USFS. The archaeological and plant survey indicated no adverse impact or disturbance by installation of gauge.
3	T23N-R12E-Sec 34 NW 1/4 - NW 1/4	Located on USFS land, accessible using USFS Road 23N06. Archaeological and plant surveys indicate no adverse impact or disturbance by installation of gauge.
4	T23N-R11E-Sec 26 NW 1/4 - SE 1/4	This gauge has been installed on private property. The archaeological and plant survey reported no impact or disturbance by installation of gauge.
5	T23N-R12E-Sec 36 SW 1/4 - NE 1/4	Located on USFS land, accessible using USFS Road 22N04. Archaeological and plant surveys indicate no adverse impact or disturbance by installation of gauge.

<u>Station</u>	<u>Location</u>	<u>Remarks</u>
6	T23N-R12E-Sec 16 NE 1/4 - SW 1/4	This gauge will be installed on private property. Archaeological and plant survey reported there was no impact or disturbance by installation of gauge.
7	T24N-R12E-Sec 31 SW 1/4 - SE 1/4	This gauge will be installed on private property. Archaeological and plant survey reported there was no impact or disturbance by installation of gauge.
8	T23N-R12E-Sec 2 SW 1/4 - NE 1/4	To be located on U. S. National Forest land, accessible by Plumas Forest Road 24N85Y. It is located in an area having a modified ROS and modification of VQ0. Detailed archaeological and plant survey indicate no impact or disturbance by installation of gauge.
9	T23N-R13E-Sec 17 NE 1/4 - SE 1/4	Located on USFS land, accessible by using USFS Road 24N07. Archaeological and plant surveys indicate no adverse impact or disturbance by installation of gauge.

APPENDIX C

NELSON CREEK WATERSHED

APPENDIX C

NELSON CREEK WATERSHED

Nelson Creek is one of the exceptional streams within the Plumas National Forest because of its characteristics and outstanding fishery. It has been included in the State of California wild trout program and has been identified in the California Protected Waterway Plan and designated as a wild trout stream from the Middle Fork Feather River to the junction of the East and West Branches of Nelson Creek, although the West Branch has been identified as a major spawning and nursery stream with high populations of trout. It lies in a densely forested north-south oriented canyon with a well shaded streambed. Pools and cascades are frequent above the Cold Creek tributary where steep gradients are common. Soils are shallow and highly erosive in these steep canyon areas.

A number of mining claims still exist along Nelson Creek and its tributaries. The mines are worked periodically through the summer months, mostly with suction dredges.

Average annual precipitation varies from 30 inches in the lower elevations to 75/inches at higher elevations and occurs mainly in the form of snow. During an average year, snow at the higher elevations accumulate 47/inches of water content and produces runoff of approximately 93,000/acre-feet from the approximate 27,000-acre watershed.

Vegetation in the drainage is a mixture of forest and chaparral with Ponderosa pine, Douglas fir, white fir at lower elevations, and red fir at higher elevations. Little logging has occurred in the drainage, leaving much of the watershed covered with substantial stands of old growth timber.

Except for periods of high runoff, intermittent sampling of the water for its quality indicates that Nelson Creek is characterized by water having excellent quality with low concentrations of suspended solids. Measurements show that the dissolved solids are low, the water temperatures are cool, and the dissolved oxygen nearly 100 percent saturation at all times.

Nelson Creek's flow improves the water quality of the Middle Fork of the Feather River by diluting organic levels, lowering water temperatures, and improving the dissolved oxygen concentrations. This water quality improvement creates a habitat better suited for trout growth and survival in the Middle Fork downstream.

In 1982, the Plumas National Forest adopted a Nelson Creek Water Quality Monitoring Plan. The objective was to provide a sensitive tool for assessing the land management practices on the trout habitat and species composition within the Nelson Creek wild trout fishery. If an adverse change in water quality occurs, a watershed condition survey can then be made to determine the source and remedy the cause.

The monitoring plan designated only one sampling station which is located at the Nelson Creek Bridge in the NE/1/4 of the SW/1/4 of Section 22, T23N, R10E.

The water quality parameters listed to be measured are: (1) streamflow in cubic feet per second (cfs), (2) suspended sediment in milligrams per liter (mg/l), (3) turbidity in Nephelometer turbidity units (NTU), (4) electrical conductivity in micromhos per centimeter at 25°C (umhos/cm), (5) water temperature in Celsius degrees (C°), (6) dissolved oxygen in milligrams per liter (mg/l), from which percent of saturation of dissolved oxygen in the water will be calculated, (7) pH, which is a measure of the hydrogen ion concentration in the water which indicates if the water is acidic, basic, or neutral, (8) nitrate (NO₃) in milligrams per liter (mg/L) which is a chief biostimulant in natural waters.

Also, included in the monitoring plan is the requirement for sampling the stream for its benthos fauna. Benthos fauna are aquatic living organisms found in the bottom substrates of bodies of water. These organisms are greatly influenced by changes in water conditions, especially in the substrate (bottom) of the stream. They cannot move great distances and thus remain at basically fixed locations. Their presence and diversity is an indicator of water quality. Bottom fauna production is related to fish production and is used as an index of the fish-carrying capacity in trout streams.

The plan recommends a sampling frequency of three times during the spring melt and four times during lower flows.

As stated on page 37 of the EIS/EIR, the entire Nelson Creek watershed will not be impacted from the proposed snowpack augmentation program. This is because only four of the ten dispensers are located where they could impact the Nelson Creek watershed. This impact will be above the confluence of the East and West Branches of Nelson Creek, comprising about 60 percent of the watershed.

The impact from these four dispensers will be further reduced as the upper areas of Nelson Creek are immediately downwind of the dispensers and the speed of the winter storms will carry most of the propane created ice nuclei beyond the Nelson Creek catchment area before they have time to grow large enough to fall as snowflakes.

Because of the uniqueness and importance of the Nelson Creek drainage, the Department will conduct a number of data collection studies to establish levels and conditions.

1. A number of surveys to collect information on the water quality parameters at the recommended sampling site on Nelson Creek and analyze for the constituents recommended in the Nelson Creek water quality plan. These include the physical, chemical, and biological parameters.
2. A fish population and species survey in a stretch of the stream near the monitoring station.
3. Erosion studies in typical areas and possible impact of additional runoff.

APPENDIX D

**CALCULATIONS ESTIMATING INCREASED RUNOFF
FROM AN AUGMENTED SNOWPACK
IN THE MIDDLE FORK FEATHER RIVER CATCHMENT AREA**

APPENDIX D

CALCULATIONS ESTIMATING INCREASED RUNOFF FROM AN AUGMENTED SNOWPACK IN THE MIDDLE FORK FEATHER RIVER CATCHMENT AREA

An "estimate" is given of the increase in precipitation rate that is expected from seeding the cold winter storms to augment the snowpack in a part of the Middle Fork Feather River selected as the project area for a prototype program. The reader is cautioned that this estimate is considered to be the most reasonable increase that might be expected, but for any given storm and for any given period within a storm, the magnitude of the increase might vary from near zero increase to up to three times the increases discussed here. However, on the average and during most storm episodes, the values given here will apply. In addition, total estimated runoff for a fully operational Prototype Program is provided. The following estimated increases in the precipitation rate from seeding winter clouds with liquid propane are based on a recent review article by Reynolds (1988), and on laboratory and theoretical studies of the effectivity of propane as a seeding agent (Hicks and Vale, 1973).

I. Ice Nuclei Flux per Dispenser

Based on the expected release rate of liquid propane and the number of ice crystals produced per gram of liquid propane (effectivity), the flux (number of crystals/time) of ice crystals can be determined.

Expected release rate per dispenser per hour = 2.5 gal/hr

$$2.5 \text{ gal/hr} \times 4.23 \text{ lbs/gal} \times \frac{1000\text{g}}{2.2 \text{ lb}} = 4807\text{g/hr propane}$$

Based on work of Hicks and Vali (1973), for every gram of liquid propane dispensed, 10^{12} ice nuclei are created.

$$4807 \text{ g/hr} \times 10^{12} \text{ crystals/g} = 4.8 \times 10^{15} \text{ crystals/hr}$$

$$4.8 \times 10^{15} \text{ crystals/hr} \times \frac{1 \text{ hr}}{3600 \text{ s}} = 1.33 \times 10^{12} \text{ crystals/s}$$

Assuming each crystal will grow in the presence of supercooled liquid water and fallout, after 1000 seconds (17 minutes) the crystals should reach to a size of 500mm and obtain a mass of $5 \times 10^{-6}\text{g/crystal}$.

$$\begin{aligned} \text{"mass flux water"} &= 1.33 \times 10^{12} \text{ crystals/s} \times 5 \times 10^{-6}\text{g/crystal} \\ &= 6.66 \times 10^6\text{g/s} \end{aligned}$$

This can be converted to acre-ft/hr per dispenser

$$\begin{aligned} &= 6.66 \times 10^6\text{g/s} \times 3600 \text{ s/hr} \\ &\times 1\text{cm}^3/\text{g} \times \frac{1 \text{ in}^3}{2.54\text{cm}} \times \frac{1 \text{ ft}^3}{12 \text{ in}} \frac{\text{acre}}{4.356 \times 10^4 \text{ ft}^2} \\ &= 20 \text{ acre-ft/hr/dispenser} \end{aligned}$$

II. Precipitation Rate Increase

Distributing the mass of precipitation over a given area will allow calculation of an augmented precipitation rate based on seeding with liquid propane.

From Reynolds (1988), it was shown that from a single dispenser a lateral plume spread of about 15 degrees can be expected. Based on crystal size and fallspeed, crystals will be expected to fallout within 30km downwind of the dispenser.

$$\text{Area} = (30 \text{ km})^2 \tan 7.5 \text{ degrees} = 118 \text{ km}^2$$

Augmented Precipitation Rate (APR) = Seeding Rate x mass/crystal x 1/area of effect

$$\text{APR} = 4.8 \times 10^{15} \text{ crystals/hr} \times 5 \times 10^{-6} \text{ g/crystal} \times \frac{-1}{118 \text{ km}^2} \times \frac{\text{km}^2}{10^5 \text{ cm}} \times 10 \text{ mm/cm} \times 1 \text{ cm}^3/\text{g}$$

$$\text{APR} = 0.2 \text{ mm/hr}$$

$$\text{or APR} = 0.2 \text{ mm/r} \times \frac{1 \text{ in.}}{25.4 \text{ mm}} = .008 \text{ in/hr}$$

$$\text{BEST ESTIMATE APR} = .01 \text{ in/hr}$$

III. Snowfall Increase

Using a simple 10 to 1 snowdepth to water equivalent ratio, the Augmented Snowfall Rate (ASR) will be:

$$\text{ASR} = 0.1 \text{ in snow/hr}$$

IV. Augmented Storm Totals and Seasonal Totals

Storm Total

Assuming 8 hrs per storm are treated

Total augmented precipitation = 2 mm/storm Water Equivalent
or .08 in/storm water equivalent

$$\text{Snow Increase} = 0.8 \text{ in}$$

Seasonal Total

Assuming 40 storms/season and a total of 10 dispensers

Total seasonal water equivalent/dispenser =
8 hrs/storm x 40 storm/season x 2 mm/8 hrs =
80mm/season/dispenser or 3 in/dispenser

Using Acre-feet/dispenser

Augmented Precipitation Over Watershed =
20 acre-ft/dispenser/hr x 10 dispensers x
8 hrs/storm x 40 storms/season = 64,000 acre-ft/season

Operating under proposed suspension criteria and 3:1 randomization is expected to reduce this potential increase by 50 percent or, on average, the expected increase is 32,000 acre-ft/season.

Assuming 70 percent runoff (Swart, et al, 1986) of the augmented precipitation.

$32,000 \times .70 = 22,400$ acre-ft runoff in Oroville

V. Expected Augmented Precipitation Over Project Area

Total project area = 164,818 acres

Area 10 km downwind from dispenser alignment = 58,496 acres

Average seasonal increase over entire project area =

$$\frac{32,000 \text{ acre-ft}}{164,818 \text{ acres}} \times \frac{12 \text{ in}}{\text{ft}} = 2.3 \text{ inches}$$

APPENDIX E

**RARE PLANT SPECIES OF CONCERN THAT OCCUR OR MAY OCCUR
WITHIN THE PROJECT AREA AND HABITAT REQUIREMENTS**

APPENDIX E

RARE PLANT SPECIES OF CONCERN THAT OCCUR OR MAY OCCUR WITHIN THE PROJECT AREA AND HABITAT REQUIREMENTS

<u>Plant Species</u> (Common Name)	<u>Listing Status*</u>			
	<u>USFWS</u>	<u>USFS</u>	<u>CDFG</u>	<u>CNPS</u>
<u>Arabis breweri</u> var. <u>austinae</u> (Chico Creek rock cress)	Candidate 2	--	Special	4
<u>Arabis constancei</u> (Constance's rock-cress)	Candidate 2	Sensitive	Special	1B
<u>Arctostaphylos truei</u> (True's manzanita)	--	--	Special	3
<u>Astragalus webberi</u> (Webber's milk vetch)	--	Sensitive	Special	3
<u>Camissonia tanacetifolia</u> ssp. <u>quadriperforata</u> (Sierra Valley evening-primrose)	Candidate 2	--	Special	3
<u>Campanula wilkinsiana</u> (Wilkin's harebell)	Category 3C	--	Special	4
<u>Carex davyi</u> (Davy's sedge)	--	--	Special	4
<u>Carex geyeri</u> (Geyer's sedge)	--	--	Special	3
<u>Carex gigas</u> (Siskiyou sedge)	--	--	Special	4
<u>Carex lasiocarpa</u> (Slender sedge)	--	--	Special	3
<u>Carex paucifructus</u> (Sierra sedge)	Candidate 2	--	Special	3
<u>Clarkia mildrediae</u> (Mildred's clarkia)	--	--	Special	4
<u>Claytonia palustris</u>	--	--	--	3
<u>Corydalis caseana</u> ssp. <u>caseana</u> (Sierra corydalis)	Category 3C	--	Special	4
<u>Cupressus bakeri</u> ssp. <u>bakeri</u> (Modoc cypress)	--	Special interest	Special	4

<u>Plant Species</u> (Common Name)	<u>Listing Status*</u>			
	<u>USFWS</u>	<u>USFS</u>	<u>CDFG</u>	<u>CNPS</u>
<u>Cypripedium californicum</u> (California lady's-slipper)	Category 3C	Special interest	Special	4
<u>Cypripedium fasciculatum</u> (Clustered lady's-slipper)	Category 3C	Special interest	Special	4
<u>Cypripedium montanum</u> (Mountain lady's-slipper)	Category 3C	Special interest	Special	4
<u>Darlingtonia californica</u> (California pitcherplant)	Category 3C	Special interest	Special	4
<u>Draba douglasii</u> var. <u>crockeri</u> (Crocker's draba)	Category 3C	--	Special	4
<u>Draba stenoloba</u> var. <u>ramosa</u> (Branched draba)	Category 3C	--	Special	4
<u>Erigeron inornatus</u> var. <u>reductus</u> (California rayless daisy)	--	--	--	3
<u>Erigeron miser</u> (Starved daisy)	--	--	Special	4
<u>Haplopappus lucidus</u> (Sticky haplopappus)	--	--	Special	4
<u>Ivesia aperta</u> (Sierra valley ivesia)	--	Sensitive	Special	4
<u>Ivesia sericoleuca</u> (Plumas ivesia)	--	Sensitive	Special	4
<u>Ivesia webberi</u> (Webber's ivesia)	--	Sensitive	Special	1B
<u>Lewisia cantelowii</u> (Cantelow's Lewisia)	Category 3C	Sensitive	Special	1B
<u>Lupinus dalesiae</u> (Quincy lupine)	Candidate 2	Sensitive	Special	4
<u>Mimulus laciniatus</u> (Cut-leaved monkey flower)	--	--	Special	4
<u>Monardella stebbinsii</u> (Stebbin's monardella)	Candidate 2	Special interest	Special	1B
<u>Penstemon neotericus</u> (Plumas County beardtongue)	--	--	Special	4

<u>Plant Species</u> (Common Name)	<u>Listing Status*</u>			
	<u>USFWS</u>	<u>USFS</u>	<u>CDFG</u>	<u>CNPS</u>
<u>Penstemon personatus</u> (Closed-throated beardtongue)	Candidate 2	Sensitive	Special	1B
<u>Perideridia bacigalupii</u> (Bacigalupi's perideridia)	Category 3C	--	Special	4
<u>Perideridia pringlei</u> (Pringle's yampah)	Category 3C	--	Special	4
<u>Polystichum Kruckebergii</u> (Kruckeberg's swordfern)	Category 3C	--	Special	4
<u>Polystichum lonchitis</u> (Holly fern)	--	--	--	3
<u>Silene invisa</u> (Short-petaled campion)	Category 3C	Sensitive	Special	4
<u>Solidago missouriensis</u> (Goldenrod)	--	--	--	3
<u>Trifolium lemmonii</u> (Lemmon's clover)	Category 3C	Special interest	Special	4
<u>Vaccinium coccinium</u> (Siskiyou mountains huckleberry)	Category 3B	Sensitive	Special	3
<u>Veronica cusickii</u> (Cusick's speedwell)	--	Special interest	Special	4

***Listing sources:**

USFWS - U. S. Fish and Wildlife Service. 1983. Endangered and threatened wildlife and plants; supplement to review of plant taxa for listing; proposed rule. Federal Register 48(229): 53640-53670.

USFS - U. S. Forest Service (Plumas National Forest).

"Sensitive" - A plant species that has been identified by the Regional Forester for which population viability is a concern.

"Special Interest" - Species by virtue of their public interest are protected to keep at a viable population level.

CDFG - California Department of Fish and Game. Species designated as "Special" are under consideration for listing by the Department.

CNPS - California Native Plant Society. Inventory of rare and endangered plants of California.

1A - Plants presumed extinct in California

1B - Plants rare and endangered in California and elsewhere

3 - Plants for which more information is needed

4 - Plants of limited distribution

Habitat Requirements

<u>Plant Species</u>	<u>Habitat Requirements</u>
<u>Arabis breweri</u> var. <u>austinae</u>	Volcanic and metavolcanic outcrops as well as serpentine and limestone; foothill canyons; around 1,500 ft; February-March.
<u>Arabis constancei</u>	Rocky, open serpentine outcroppings; 3,800-6,600 ft; March-May.
<u>Arctostaphylos truei</u>	Granitic formations with chaparral; between 1,500-3,500 ft.
<u>Astragalus webberi</u>	Brushy slopes of mixed conifer forest; 2,700-5,000 ft; May-July.
<u>Camissonia tanacetifolia</u> ssp. <u>quadriperforata</u>	
<u>Campanula wilkinsiana</u>	Moist places; red fir to subalpine forests; 6,000-8,500 ft; July-September.
<u>Carex davyi</u>	Dry meadows and open woods of red fir and subalpine forests; 4,800-10,600 ft.
<u>Carex geyeri</u>	Dry slopes and open woods around 5,000 ft in sage brush scrub and yellow pine forest.
<u>Carex gigas</u>	Meadows and rocky slopes of yellow pine and red fir forests; 2,800-6,000 ft.
<u>Carex lasiocarpa</u>	Edges of ponds; 6,700 ft.
<u>Carex paucifructus</u>	Red fir and subalpine forests; 6,500-8,300 ft.
<u>Clarkia mildrediae</u>	Coarse granite sand around 2,000 ft; yellow pine forests; June-July.
<u>Claytonia palustris</u>	Sunny areas, wet meadows, marshy slopes, and streamside vegetation; 3,360-5,400 ft.
<u>Corydalis caseana</u> ssp. <u>caseana</u>	Springs and edges of creeks; must have available water; June-August.
<u>Cupressus bakeri</u> ssp. <u>bakeri</u>	Dry serpentine and volcanic soils in mixed conifer and yellow pine forests; 6,000-7,000 ft.

<u>Plant Species</u>	<u>Habitat Requirements</u>
<u>Cypripedium californicum</u>	Wet, rocky ledges and moist hillsides; seep areas on granite and serpentine; mixed evergreen forests; 1,600-4,000 ft; May-June.
<u>Cypripedium fasciculatum</u>	Open, rocky woods of yellow pine forests often with 60-100% shade; 2,000-6,000 ft; April-July.
<u>Cypripedium montanum</u>	Open, moist slopes with north or south aspects or riparian areas; mixed coniferous forests below 5,000 ft; May-August.
<u>Darlingtonia californica</u>	Marshy and boggy places, usually on serpentine soils; yellow pine and red fir forests; 3,000-6,000 ft; April-June.
<u>Draba douglasii</u> var. <u>crockeri</u>	Dry, rocky slopes of yellow pine and lodgepole forests; 5,000-8,000 ft; May-June.
<u>Draba stenoloba</u> var. <u>ramosa</u>	Subalpine forests and alpine fell-fields; 7,000-12,000 ft; June-August.
<u>Erigeron inornatus</u> var. <u>reductus</u>	Yellow pine and red fir forests; 5,000-7,000 ft; July-September.
<u>Erigeron miser</u>	Clefts in granite; red fir forests; 6,500-7,500 ft; July-August.
<u>Haplopappus lucidus</u>	Alkaline flats and forest openings; yellow pine forest; 2,500-5,000 ft; July-September.
<u>Ivesia aperta</u>	Dry alkaline flats and meadows; 4,500-6,800 ft; June-August.
<u>Ivesia sericoleuca</u>	Dry alkaline flats and meadows mostly in sagebrush scrub; 4,500-6,600 ft; June-August.
<u>Ivesia webberi</u>	Dry, barren ground in open patches of volcanic ash in sagebrush scrub; 5,000-6,000 ft; May-July.
<u>Lewisia cantelowii</u>	Bedrock outcrops of wet serpentine, granite, or metavolcanic; flat to steep slopes; in crevices and on ledges; 1,500-3,000 ft; yellow pine forest; May-October.
<u>Lupinus dalesiae</u>	Open (often barren) dry slopes in mixed conifer forests; 3,000-7,500 ft; May-July.
<u>Mimulus laciniatus</u>	Damp, sandy places; yellow pine and red fir forests; 3,300-8,700 ft; May-July.

Plant Species

Habitat Requirements

Monardella stebbinsii

North-facing slopes of unstable serpentine talus, supporting only sparse vegetation; 2,700-3,400 ft; July.

Penstemon neotericus

Dry places of yellow pine forests; 3,500-6,000 ft; May-August.

Penstemon personatus

Dry soil of hillsides; also in cutbanks, talus, and deep humus; north-facing slopes; red fir and mixed coniferous forests; 3,500-6,000 ft; July-August.

Perideridia bacigalupii

Perideridia pringlei

Open slopes and canyons; chaparral; 1,000-3,500 ft; April-June.

Polystichum Kruckebergii

Dry crevices and rocky places of montane coniferous forests; 5,000-10,500 ft.

Polystichum lonchitis

Shady, rocky places; red fir and subalpine forests; 5,000-7,000 ft.

Silene invisa

Along moist or dry meadow edges, stream banks, or floodplains and near forest edges under a red or white fir canopy; exists on slight to moderately steep (0-60%) north-facing slopes; 5,800-9,000 ft; July-August.

Solidago missouriensis

Meadowlands and upland valleys; sagebrush scrub; 4,000-5,000 ft; August-October.

Trifolium lemmonii

Rocky flats and bare knolls in yellow pine forest and sagebrush scrub; 5,000-7,000 ft; June-July.

Vaccinium coccinium

Moister slopes of mixed conifer and red fir forests; 5,000-7,000 ft; June-August.

Veronica cusickii

Gravelly soil in openings in conifer forests and alpine meadows; lodgepole pine and subalpine forests; 6,500-9,200 ft; July-August.

APPENDIX F

PUBLIC COMMENTS AND RESPONSES



Center for Urban Affairs
and Policy Research
NORTHWESTERN UNIVERSITY

Mary J. Culombe, Forest Supervisor
Pleumes National Forest
P.O. Box 11500
Quincy, CA 95971

April 8, 1990

Dear Forest Supervisor:

Please send me what survey material, etc you can
concerning the Prototype Cloud Seeding Project. Please
keep me on the mailing list.

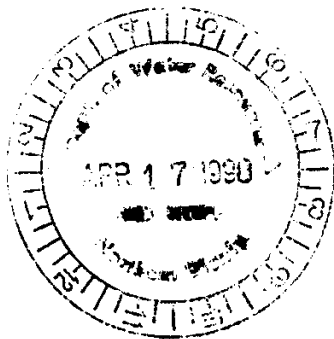
I urge you to consider the impact on species
composition, etc. not only for the prototype seeding, but
also for any prospective adoption of cloud seeding as a
regular and recurring aspect of water management in the Sierra

Thanks. lol!

Sincerely,

H. Paul Friesen
Professor

H. PAUL FRIESEN A



Response to comments from Dr. H. Paul Friesema:

The proposed prototype cloud seeding program is designed to result in augmentation of snowpack during years of less than normal precipitation. Suspension criteria would result in termination of cloud seeding before snowpack depths or rainfall amounts exceed historical limits. The project will be controlled to operate only when the cumulative water content of the snowpack will remain within historically measured natural variations. Since any additional precipitation from the proposed program would be within historical limits, no adverse effects to wildlife species are anticipated. Prior to expansion of this prototype project, an Environmental Impact Report would be prepared that would address the effects of cloud seeding on wildlife species.

State of California

Business, Transportation and Housing Agency

M E M O R A N D U M

To: Mr. R. Lallatin
California Department
of Resources
2440 Main Street
Red Bluff, CA 96080

IGR/CEQA Review
02-Plu-70
SCH No. 88020108

From: DEPARTMENT OF TRANSPORTATION - District 2

Subject: Prototype Cloud Seeding

Caltrans District 2 received your document regarding the above-referenced project. This project proposes to enhance water yield by augmenting the snow pack through cloud seeding winter storms.

The subject property is located on the Middle Fork of the Feather River which impacts our highway at several locations.

Please inform our District Hydrologist, Al Trujillo, during and after the prototype project, of any runoff rate changes. Mr. Trujillo can be reached at (916) 225-3010.

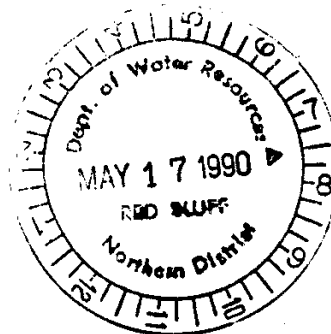
Thank you for providing this EIS/EIR for our review. If you have any questions or concerns regarding this letter, please call me at (916) 225-3259.

Yours very truly,

L. Michelle Gallagher

L. MICHELLE GALLAGHER
IGR/CEQA Coordinator,
Environmental Services Branch,
District 2

RH:jt
cc:GMDrennan
Environment
ATrujillo
Nadel Gayou, Dept. of Water Resources
Dan Kapolsky
7-342



Response to comments from Ms. L. Michelle Gallagher, Department of Transportation:

The snowpack augmentation program will generate an increase in natural streamflow which will be in the form of sustained higher flow, but not an increased streamflow peak. We will keep Mr. Trujillo, Department of Transportation District Hydrologist, informed of runoff rates.

P.O. Box 1782
Quincy, CA
95971
May 29, 1990

Calif. Dept. of Water Resources
R.D. Lallatin, Project Manager
P.O. Box 607
Red Bluff, CA 96080



Dear Mr. Lallatin:

I am opposed to your proposed cloud seeding project in Plumas County for the following reasons:

- The project is proposed to lessen the effects of drought - a natural part of our local climatic cycle.
- The water to be taken from clouds above Plumas County is to be used elsewhere. Perhaps the carrying capacity for human populations in those more arid areas has been reached or exceeded. Relying artificially generated precipitation through an artificial waterway further removes those populations from acquiring such a basic & essential human need (water) in a simple way.

The complex water delivery system creates too much of a dependency on another high-tech fix to a basic problem. Populations need to distribute themselves where their basic needs can be acquired locally. Government is doing us a grave disservice by artificially expanding the carrying capacity of certain areas. We've got to learn to work w/ nature & within her bounds. Conquering has never worked.

- The cumulative effects of so many weather modification projects are still unknown. When the effects become apparent & there are so many projects in so many different jurisdictions in the world, how will we stop them?

No, sir. Weather modification is not the answer. Conservation, redistribution of populations & improved agricultural practices are the answers to our water problems. But they're harder to do. But that's why our taxes pay your salary - so you come up w/ the best long term solutions to our problems. Sincerely,
Cherie Mink

Response to comments from Ms. Leslie Mink:

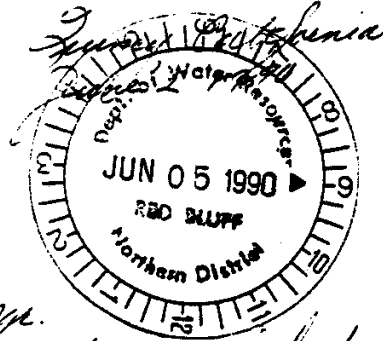
The purpose of the project is, indeed, to lessen the effects of drought. Though drought is a natural part of the local climatic cycle, lost wildlife and habitat during such occurrences can take years to recover. Enhancing water supplies through snowpack augmentation can reduce some of the adverse effects of drought.

Part of the function of government is to provide basic services, such as water supply, to regions with need for such services. Some of the water generated through the project will be used locally via ground percolation and recreation at Lake Oroville. The people of the State of California approved the water supply system that provides water to more arid regions. This water is used for municipal supply as well as agriculture and industry, whose products benefit people throughout the state and nation.

Should the cumulative effects of cloud seeding projects become apparent and adverse, proponents will have to mitigate the adverse effects. Projects are not likely to receive approval whose adverse effects cannot be mitigated.

Water conservation, waste water re-use, and improved agricultural practices are currently used to stretch available water supplies. However, these measures are not sufficient to meet the water needs of California in every year. Additional measures, such as recharge of ground water basins and cloud seeding, are necessary to augment other available water supplies.

Dept. of Water Resources
P.O. Box 687
Red Bluff, CA 96080



Attn: R. V. Lallan, Project Mgr.

First and foremost, water is life!
We see the draft on the impact statement
and report, as well as the slide shown ^{May 22}, has
been well presented and thorough with no
foreseeable adverse effects. This is the only way
to get enough frozen snow pack at the higher
elevations to gradually feed the streams and
also add to the underground water which is
diminishing.

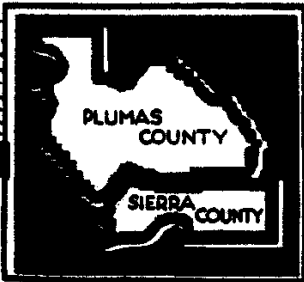
We are in favor of cloud seeding and
would like to see our higher peaks retain
a snow pack until late June or July as it
has in previous years before the drought.

cc: R.C. Bennett, Plumas
National Forest
Board of Supervisors,
Plumas Co.

Sincerely,
Virginia Bressan
Virginia Bressan

Response to comments from Ms. Virginia Bresciani:

The Department of Water Resources and U. S. Forest Service appreciate your support for this project.



Indian Valley Grange No. 439
Feather River Grange No. 440
Sierra Valley Grange No. 466

Plumas-Sierra Pomona Grange No. 18
P.O. Box 192 Taylorsville, CA. 95983

⌘ June 4, 1990

Office of
California Department of
Water Resources
P.O. Box 607
Red Bluff, CA. 96080

ATTN: Richard D. Lallatin

RE: Prototype Project To Augment Snow Pack, Using Ground Based
Dispensers.

The Plumas-Sierra Pomona Grange #18, an organization of 631 members in Plumas & Sierra counties, at a regular meeting have voted to go record as being in favor of this proposed project using propane as an agent to increase the snow fall in our area.

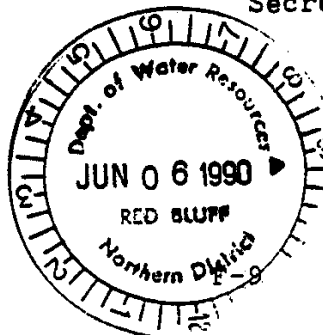
The use of propane for this purpose in the past has produced no noticable adverse effects.

Since snowpacks and water tables are below normal, we feel that this is a desirable project.

Respectfully,

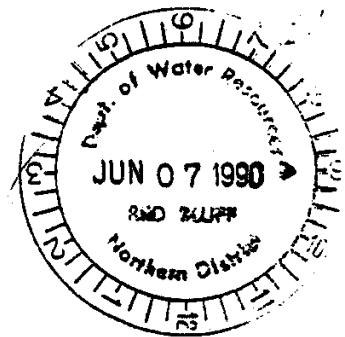
Richard D. Lallatin
Secretary

LEGIS. COMM:
Louis Thomas
Bill Scovell
Virginia Bresciani



Response to comments from Ms. Thelma Louthan, Plumas-Sierra Pomona
Grange No. 18

The Department of Water Resources and U. S. Forest Service
appreciate your support for this project.



June 5, 1990

Mr. R. D. Lallatin, Project Manager
California Department of Water Resources
P.O. Box 607
Red Bluff CA 96080

Re: Comments on Draft Environmental Impact
Statement/Report-Prototype Project to
Augment Snow Pack by Cloud Seeding
Using Ground Based Dispensers

Dear Mr. Lallatin:

The members of the Portola City Council have reviewed the above referenced draft environmental impact statement/report. In addition, the draft EIS/EIR was discussed at length at the regularly scheduled Council meeting of June 4, 1990.

As noted on page 35 of the draft EIS/EIR, the incorporated City of Portola is located within the project boundary.

The Portola City Council is very supportive of any project which would potentially increase water supplies for this region. However, a project which could increase the amount of snowfall could also adversely impact the City of Portola in the form of additional snow removal costs.

On page 55 of the draft EIS/EIR, it states, "...the Department has agreed with Plumas County to compensate them for any additional snow removal costs that could be assumed to result from the operation of this snowpack augmentation project".

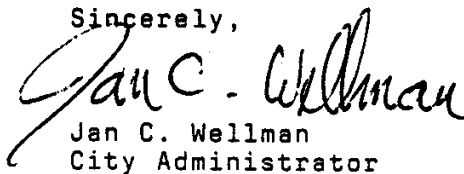
As the City of Portola is an incorporated City and receives no snow plowing assistance from Plumas County, a similar agreement should be made, between the Department and the City of Portola, for compensation for additional snow removal costs assumed to result from this project.

Please consider this letter a request, from the City of Portola, for an agreement, similar in intent to that afforded Plumas County, to compensate for additional snow removal costs assumed to result from this project.

Mr. R. D. Lallatin
Page 2
June 5, 1990

If you have any questions concerning the City of Portola's request/
comment, please contact me at your convenience.

Sincerely,


Jan C. Wellman
City Administrator

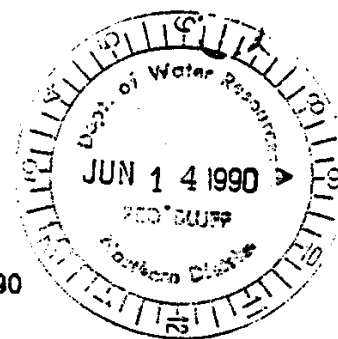
JCW:jm

Response to comments from Jan C. Wellman, City Administrator, City
of Portola:

The Department of Water Resources and U. S. Forest Service
appreciate your support for this project. The Department has
agreed to compensate Plumas County for any additional snow removal
costs that could be assumed to result from the snowpack
augmentation project and will do the same for the City of Portola.



California Sportfishing Protection Alliance



Mr. R.D. Lallatin, Project Manager
Department of Water Resources
P.O. Box 607
Red Bluff, CA 96080

June 12, 1990

Re: Draft Environment Impact Statement (EIS) - Environment Impact Report (EIR) for the Proposed Prototype Weather Modification Project for the State Water Project to Augment Snow Pack in the Nelson Creek Watershed and in the Middle Fork Feather River Basin by Cloud Seeding Using Ground Based Dispensers in Plumas and Sierra Counties, California; Comments to Draft EIS-EIR by the California Sportfishing Protection Alliance (CSPA).

Dear Mr. Lallatin:

The Department of Water Resources (DWR) is proposing to conduct a five (5) year operational test program by augmenting the snow pack in an area of the Wild and Scenic Middle Fork Feather River Basin by cloud seeding winter storms using ground-based dispensers located on mountain tops in the vicinity of the Lakes Basin Area on the Plumas National Forest. Nelson Creek, a state designated wild trout stream, is also included in the project area. The additional snow pack will produce a net 21,000 acre-feet [30,000 acre-feet gross] of water for use at the Oroville Facility of the State Water Project [Oroville Reservoir] for contractors using State Water Project water. The proposed DWR project facilities will be located on both Plumas National Forest [public lands] and private lands.

The draft EIS/EIR claims the environmental document is in compliance with the National Environment Policy Act (NEPA), the California Environmental Quality Act (CEQA), Federal Regulations (CFR), Forest Service 1950 Manual, and the Plumas National Forest Land and Resources Management Plan (PNF Forest Plan).

Comments By the CSPA and Friends of Plumas Wilderness

We have reviewed the draft EIS/EIR for the proposed project. The following are the comments of the CSPA and Friends of Plumas Wilderness regarding the contents of the draft EIS/EIR:

The draft EIS/EIR for the proposed project is grossly deficient as written, is in violation of the mandatory NEPA requirements [Section 1500 et seq CFR 40], is in violation of the mandatory CEQA requirements [CEQA Guidelines], is not in compliance with the standards and guidelines in the PNF Forest Plan, and conflicts with State Policy regarding the Nelson Creek watershed and the Wild and Scenic Middle Fork Feather River Basin.

Water Quality Problems Directly Related to this Project

Additional snowfall and rainfall created by this project in the "project area" and in the "extended project area" will incrementally result in contributing to water quality problems presently existing in the forest environment of the PNF which will adversely affect water quality in those water problem areas. The following is a ranking of major water quality problems affecting existing water quality in the PNF:

Ranking of the Top Twelve (12) Non-Specific (Widespread) Water Quality Problems in the Plumas National Forest. [Watershed Improvement Program for the Plumas National Forest - 1989]

1. Failure to close and revegetate old roads causing erosion and sedimentation.
2. Road construction and maintenance features and techniques causing inadequate drainage and concentration of water onto sensitive soils, thus leading to erosion and sedimentation.
3. Indiscriminate use of unstabilized road surfaces in wet weather causing erosion and sedimentation.
4. Erosion from fill slopes (especially from granitic soils) is a chronic Forest-wide problem.
5. Salvage logging activities often have a disproportionately large, widespread impact on the Forest road system's drainage works.
- 6a. Undesigned berms keep water on road surface, resulting in erosion and sedimentation.
- 6b. Water bar deficiencies contribute to erosion and sedimentation.
7. Roads designed or constructed beyond the minimum needed to accomodate the use exposes additional area to erosion and sedimentation.
8. Construction of emergency fire access roads, trails and firelines in sensitive areas (along streamcourses and wet areas) causes erosion and sedimentation.
- 9a. Pulling culverts or logs from temporary roads often causes more sedimentation than the long term results of leaving them in place.
- 9b. Roads designed or reconstructed near a stream or in a flood plain without sufficient protective features are a direct source of excessive sedimentation.

10. Dry blading usually creates a fresh sediment source.

11. Sidecasting of material during road maintenance commonly results in stream and riparian damage.

12a. Surface disturbance and the exposure of mineral soil by yarding and harvesting operations is a long term source of erosion and sediment.

12b. The lack of emphasis and attention to culvert and catch basin cleaning causes excessive sedimentation.

The draft EIS-EIR failed to evaluate the above mentioned existing water quality problems in the "project area" and "extended project area" of the PNF, and the resulting direct, indirect and cumulative incremental environmental effects from this project to PNF lands. The draft EIS-EIR also failed to evaluate the effects to water quality on private lands in the "project area" and "extended project area" and the resulting direct, indirect and cumulative incremental environmental effects from this project. Both NEPA and CEQA require that the draft EIS-EIR be site specific and evaluate the potential direct, indirect and cumulative effects to the environment to be affected by the project.

As stated by the U.S. Forest Service on May 1, 1990 in their Responsive Statement to the PNF Land and Resource Management Plan Appeal and Statement of Reasons by Appellants [Friends of Plumas Wilderness, California Sportfishing Protection Alliance, Natural Resources Defense Council, Sierra Club, The Wilderness Society, Friends of the River and California Trout]:

"Maintain or improve water quality to protect beneficial uses and meet or exceed State objectives." [Page 24]

"Inventory existing water use affecting the Forest and regulate or recommend regulations of future uses to assure an adequate supply for PNF and instream needs." [Page 24]

"Reduce sediment yields from watersheds in deteriorating condition and those tributary to eroding channels or hazardous floodplain prone areas." [Page 24]

"Ensure public safety and property protection from the hazards of flooding by minimizing occupancy and modification of flood plains." [Page 24]

"Avoid water quality degradation by using Best Management Practices during land management activities, and reduce sedimentation and channel erosion by rehabilitating deteriorating watersheds." [Page 25]

"For individual projects that are initiated to implement the Plan [PNF Forest Plan], a site specific environmental analysis will be conducted. The appropriate BMPs necessary to protect or improve water quality and the methods and techniques for implementing the BMPs are identified during project-specific analysis. The methods and techniques are tailored to fit the specific physical-biological environment as well as the proposed project activities (Plan Appendix Q, p. Q-1 to Q-2, and Chapter 10 of FSH 2509.22, and to meet NEPA requirements." [Page 25] (Our Emphasis)

"The environmental analysis displayed in the EIS [Forest Plan] is a cumulative effects analysis, even though it is not specifically called that in the document. This was a broad programmatic analysis which is appropriate for decisions to be made in the adoption of a plan for the management of the PNF." [Page 28]

"Site specific decisions are not made in the Plan. This is discussed in response to Contention (a) of Sub-Issue #3A. Cumulative effects of projects are considered during the project level environmental analysis." [Page 29] (Our Emphasis)

"Based on the responses to Contentions (a) through (e) no purpose would be served in withdrawing the EIS [Plan] to perform cumulative watershed effects analysis. That level of analysis will be done for individual projects." [Page 29] (Our Emphasis)

CONCLUSION:

AS CLEARLY STATED BY THE U.S. FOREST SERVICE ON MAY 1, 1990, SITE SPECIFIC AND CUMULATIVE ENVIRONMENTAL EFFECTS WILL BE CONSIDERED DURING THE PROJECT LEVEL ENVIRONMENTAL ANALYSIS FOR INDIVIDUAL PROJECTS. THE DRAFT EIS-EIR IS GROSSLY DEFICIENT FOR FAILING TO ADDRESS, EVALUATE, AND MITIGATE THE SITE SPECIFIC AND INCREMENTAL DIRECT, INDIRECT, AND CUMULATIVE EFFECTS TO WATER QUALITY IN THE PNF AREA TO BE AFFECTED BY THE PROJECT, AND ALSO THE INCREMENTAL DIRECT, INDIRECT AND CUMULATIVE EFFECTS TO WATER QUALITY ON PRIVATE LANDS TO BE AFFECTED BY THE PROJECT.

Questions Related to the Effects from this Project to Existing Water Quality Problems in the PNF Within the "Project Area" and the Extended Project Area".

a) How many miles of existing and old roads causing erosion and sedimentation are there in the "project and extended project areas? What will be the incremental direct, indirect and cumulative effects to water quality from erosion and sedimentation caused from this project from existing and old roads [Public/Private] in the project and extended project area? Please be specific.

b) What will be the incremental increase to erosion and sedimentation on waterways on public and private lands, and the subsequent effects to water quality from existing and old roads in the project and extended project areas from this project? Please be specific.

c) What will be the direct, indirect and cumulative incremental effects from erosion to water quality in sensitive soil areas on PNF and private lands in the project and extended project areas from this project? Please be specific.

d) The PNF is presently planning to conduct forestwide salvage and fire salvage sale projects due to the effects of the drought and wildfire. What will be the incremental direct, indirect and cumulative effects from this project to PNF soil disturbance management activities caused by PNF salvage and fire salvage activities in the project and extended project areas? Please be specific and identify specific PNF salvage and fire salvage projects and waterways to be affected in each Ranger District area.

Nelson Creek Watershed and the Middle Fork Feather River

The proposed project will incrementally alter and affect water quality in the Nelson Creek watershed, and will also incrementally alter and affect water quality in the Wild and Scenic Middle Fork Feather River Basin during runoff periods. Though the project will increase the snowpack by 5% or more, the timing of runoff events could increase the runoff significantly in conjunction with land disturbance activities [past, present, and future] causing incremental adverse effects to water quality, fishery habitat and sportfishing [turbidity- suspended sediment- higher project caused flows].

Nelson Creek is a tributary to the Wild and Scenic Middle Fork Feather River. The alteration of water quality may potential have direct, indirect and cumulative effects not only to water quality, but also to fishery habitat and sportfishing in both the Nelson Creek watershed and the Wild and Scenic Middle Fork Feather River Basin (MFFR). Both Nelson Creek and the Wild and Scenic Middle Fork Feather River were designated "Wild Trout Streams" by the State of California. It is the policy of the State of California to oppose projects which will affect designated "Wild Trout Waters".

The Wild and Scenic MFFR was designated a Wild and Scenic River by Congress and is protected under the provisions of the Wild and Scenic River Act.

Nelson Creek is one of the exceptional rivers within the Plumas National Forest. It provides unique recreation opportunities to the forest users, outstanding scenery, fine fishing and sites of historic interest. Its watershed is characterized by deeply incised canyons and steep uplands, provides dispersed recreational opportunities as well as timber, water and minerals resources.

F-18

Nelson Creek lies in a densely forested north-south oriented canyon, with a well shaded streambed. Pools and cascades are frequent especially above Cold Creek where steep stream gradients become common. Geology of the Nelson Creek drainage is dominated by the Calaveras formation, basically a slaty marine sediment of the Paleozoic time. Soils in the Nelson Creek watershed are shallow and highly erosive in the steep canyon areas. (Our Emphasis)

The climate in the Nelson Creek watershed is mediterranean, characterized by moderately cold winters and mild summers. Average annual precipitation varies from 30 inches at lower elevations to 75 inches at higher elevations. Precipitation is mainly in the form of snow, with snow at the 7,000 foot level accumulating to 47 inches water content during an average year. The watershed, 27,000 acres in size, yields a yearly average of 93,000 acre-feet of water. During the summer and fall, Nelson Creek contributes one-fourth to one-third of the Wild and Scenic Middle Fork's flow at Nelson Point, helping maintain amiable [cool water] temperatures for wild trout within the Wild and Scenic MFFR. (Our Emphasis)

Vegetation in the Nelson Creek drainage is a mixture of forest and chaparral. Greenleaf manzanita dominates the chaparral community, while the forest community is dominated by Ponderosa pine, Douglas fir and white fir at lower elevations and red fir at higher elevations. In 1982 little logging activity occurred in the drainage leaving much of the watershed covered with substantial old growth timber, however the PNF is proposing to conduct major logging activities in the near future.

The specific management objectives in the "California Department of Fish and Game Management Plan for the Nelson Creek Watershed" is as follows:

(1) To maintain wild trout populations at levels necessary to provide satisfactory recreational angling opportunities for wild trout; (2) To maintain and enhance where possible the habitat required for optimum wild trout production; and (3) To preserve the natural character of the streamside environment.

The Plan also stated that the management of backcountry streams such as Nelson Creek will also emphasize maintenance of the remote secluded quality of the angling experience, which generally involves minimizing angler encounter with man-made alterations or activities. (Our Emphasis)

In 1971, that portion of Nelson Creek between the MFFR and the confluence of the East Branch with the West Branch of Nelson Creek was designated by the State of California as a "Wild Trout Stream". The goal of the "Wild Trout Program" used in managing "Wild Trout Streams" is to preserve unique stream trout fisheries which are naturally sustained by

wild strains of trout. The guidelines for this program are: (1) To maintain wild trout populations at levels necessary to provide satisfactory recreational angling opportunities for wild trout; (2) To maintain and enhance where possible the habitat required for optimum wild trout production; and (3) To preserve the natural character of the streamside environment.

Nelson Creek is considered an outstanding fishery [Wild Trout], and was nominated by the PNF in 1970 as a prime candidate for the "Wild Trout Program". In addition, Nelson Creek was identified in the "California Protected Waterway Plan" as an important waterway deserving special consideration. The California Department of Fish and Game has remarked that the water quality of Nelson Creek is exceptional providing excellent habitat for trout. The stream's cold and well-oxygenated waters play an important role in improving the water quality in the Wild and Scenic MFFR.

CONCLUSION:

(1) THE DRAFT EIS/EIR DID NOT EVALUATE THE CONFLICT BETWEEN THIS PROJECT AND STATE POLICY WHICH GOVERNS AND PROTECTS "WILD TROUT STREAMS" IN CALIFORNIA AS DESIGNATED BY THE STATE OF CALIFORNIA. THE PROPOSED PROJECT CONFLICTS WITH STATE POLICY BECAUSE OF THE POTENTIAL TO INCREMENTALLY INCREASE RUNOFF AND CAUSE ADVERSE INCREMENTAL WATER QUALITY CONDITIONS IN THE NELSON CREEK WATERSHED IN CONJUNCTION WITH SEVERAL PROPOSED PNF TIMBER SALE PROJECTS PRESENTLY BEING PLANNED BY THE PNF. WE BELIEVE THE PROPOSED PROJECT IN CONJUNCTION WITH THE PROPOSED PNF TIMBER SALE PROJECTS WILL VIOLATE THIS STATE POLICY.

(2) THE AFFECTED ENVIRONMENT PORTION OF THE DRAFT EIS/EIR IS GROSSLY DEFICIENT AND MISLEADING IN THAT IT DID NOT PROPERLY DESCRIBE THE SITE SPECIFIC ENVIRONMENT OF THE NELSON CREEK WATERSHED TO BE AFFECTED BY THE PROJECT. [AS CLEARLY STATED ABOVE, WHICH WAS DESCRIBED IN THE FOLLOWING FEDERAL AND STATE DOCUMENTS: (1) "PNF FOREST PLAN"; (2) "PNF NELSON CREEK WATER QUALITY MONITORING PLAN"; AND THE "DFG NELSON CREEK WILD TROUT MANAGEMENT PLAN"].

THE DRAFT EIS/EIR IS DEFICIENT FOR THIS REASON BECAUSE IT FAILED TO DESCRIBE THE SITE SPECIFIC AFFECTED ENVIRONMENT OF THE NELSON CREEK WATERSHED TO BE INCREMENTALLY AFFECTED BY THE PROPOSED PROJECT. BOTH CEQA AND NEPA REQUIRES DIRECT, INDIRECT, AND CUMULATIVE EFFECTS TO BE INCLUDED IN AN EIS AND EIR. THE DRAFT EIS/EIR IS GROSSLY DEFICIENT FOR THIS REASON.

(3) THE DRAFT EIS/EIR FAILED TO EVALUATE DIRECT, INDIRECT AND CUMULATIVE PROJECT EFFECTS TO RECOMMENDATIONS, MANAGEMENT OBJECTIVES AND GOALS BY THE CALIFORNIA DEPARTMENT OF FISH AND GAME (CDFG) FOR THE WILD TROUT FISHERY OF THE NELSON CREEK WATERSHED AS STATED IN THE NELSON CREEK WILD TROUT MANAGEMENT PLAN. BOTH CEQA AND NEPA REQUIRES DIRECT, INDIRECT AND CUMULATIVE EFFECTS TO BE INCLUDED IN

AN EIS AND EIR. THE DRAFT EIS/EIR IS GROSSLY DEFICIENT FOR THIS REASON AND IS ALSO IN VIOLATION OF THE BOTH NEPA AND CEQA REQUIREMENTS.

(4) THE DRAFT EIS/EIR CLAIMS BASED ON STUDIES CONDUCTED FOR THE SKYWATER FEIS, AND ALSO AT THE SIERRA ECOLOGY PROJECT WORKSHOPS AND THE MEDICINE BOW ECOLOGY PROJECT INVESTIGATIONS, THE INCREASED SNOWFALL AND RAINFALL AMOUNT RESULTING FROM THE PROPOSED PROJECT IS OF MINOR IMPORTANCE TO THE AQUATIC ECOSYSTEM AND WILL NOT ADVERSELY IMPACT WARMWATER FISH OR TROUT.

THE TIERING OF THIS DRAFT EIS-EIR TO ANOTHER FOREIGN FEIS DOES NOT COMPLY WITH THE NEPA REQUIREMENT. THE DRAFT EIS/EIR FAILED TO EVALUATE THE POTENTIAL ADVERSE SITE SPECIFIC DIRECT, INDIRECT AND CUMULATIVE EFFECTS TO WATER QUALITY, FISHERY HABITAT AND THE AQUATIC RESOURCES IN THE NELSON CREEK WATERSHED FROM THE PROPOSED PROJECT. BOTH CEQA AND NEPA REQUIRES SITE SPECIFIC ENVIRONMENTAL EFFECTS TO BE INCLUDED IN AN EIS AND EIR. THE DRAFT EIS/EIR IS GROSSLY DEFICIENT FOR THIS REASON, AND IS ALSO IN VIOLATION OF THE BOTH NEPA AND CEQA REQUIREMENTS.

(5) THE SOIL WRITE-UP IN THE AFFECTED ENVIRONMENT PORTION OF THE DRAFT EIS/EIR IS GROSSLY DEFICIENT AND MISLEADING IN THAT IT DID NOT PROPERLY DESCRIBE THE SITE SPECIFIC SOILS IN THE NELSON CREEK WATERSHED. AS STATED BEFOREHAND, THE SOILS IN THE NELSON CREEK WATERSHED ARE HIGHLY EROSIVE.

AS STATED IN THE PNF FOREST PLAN FOR THE TURKEYTOWN MANAGEMENT AREA [18] [LAPORTE RANGER DISTRICT], - " SOILS HAVE MODERATE TO HIGH ERODIBILITY. RISK OF INSTABILITY IS MODERATE TO HIGH DUE TO THE PRESENCE OF UNSTABLE YOUNGER VOLCANICS OVERLYING MORE RESISTANT BEDROCK ON STEEP SLOPES. THE ENTIRE AREA [TURKEYTOWN MANAGEMENT AREA] IS WITHIN THE WATERSHED OF NELSON CREEK, A TRIBUTARY OF THE MIDDLE FORK FEATHER RIVER."

BOTH CEQA AND NEPA REQUIRES DIRECT, INDIRECT AND CUMULATIVE EFFECTS TO THE SOIL ENVIRONMENT OF THE NELSON CREEK WATERSHED TO BE EVALUATED AND INCLUDED IN THE DRAFT EIS AND EIR. THE DRAFT EIS/EIR IS GROSSLY DEFICIENT BECAUSE IT FAILED TO PROPERLY EVALUATE THE DIRECT, INDIRECT AND CUMULATIVE EFFECTS TO SOILS IN THE NELSON CREEK WATERSHED.

Cumulative Effects - Proposed Timber Sale Projects

Presently the PNF has proposed a significant number of timber sale projects in the LaPorte and Beckwourth Ranger Districts which will cumulatively alter and affect water quality in the Nelson Creek watershed and also in the Wild and Scenic MFFR Basin. The alteration of water quality in both the Nelson Creek Watershed and the MFFR Basin may potentially cause adverse effects to wild trout populations and habitat.

Proposed controversial PNF timber sale projects [green tree] which will directly, indirectly and cumulatively affect the Nelson Creek Watershed are as follows: (1) Buzzards Roost Timber Sale (TS), (2) Frenchman TS, (3) Garbini TS, (4) Eureka TS, (5) Fingerboard TS, (6) Golden TS, (7) Rock TS, and the (8) Blue Nose TS.

Proposed controversial PNF timber sale projects [green] which will directly, indirectly and cumulatively affect water quality in the Wild and Scenic MFFR are as follows: (1) Feather Falls TS, (2) Barkers Cabin TS, (3) Onion Valley TS, (4) Minerva TS, (5) Hartman TS, (6) Diamond Back TS, (7) Happy TS, (8) South Fork/Rock Creek TS, and (9) Cascade TS. Subsequently, 17 known green timber sale projects will alter and affect water quality in the Wild and Scenic MFFR.

The PNF is proposing the Layman Fire Salvage Sale Project. The Layman FS Project is within the project area. The Beckwourth Ranger District is also proposing a Districtwide Salvage Sale Project. The Beckwourth Ranger District is in the project area. The PNF is also proposing 30 to 35 salvage sale projects in the Milford Ranger District. The PNF is also proposing the Eagle Fire Salvage Sale. The Eagle FS Project is also in the Milford Ranger District.

Therefore, cumulatively, a host of salvage, fire salvage and green timber sale projects being proposed by the PNF are in the project area and will alter and affect water quality in the Wild and Scenic MFFR. Also, cumulatively, a host of salvage sale projects are in the extended project area. The cumulative effects from the above mentioned projects were not evaluated in the draft EIS-EIR.

This project and the proposed PNF salvage, fire salvage and green timber sale projects as described above will have potential adverse cumulative effects to water quality and fishery habitat in the Nelson Creek watershed, in the Wild and Scenic MFFR Basin, and also in many waterways within the project and extended project areas in the PNF.

CONCLUSION:

(6) THE POTENTIAL CUMULATIVE EFFECT WRITE-UP IN THE DRAFT EIS/EIR IS GROSSLY DEFICIENT AND MISLEADING IN THAT IT DOES NOT PROPERLY DESCRIBE THE POTENTIAL CUMULATIVE ADVERSE EFFECTS TO WATER QUALITY AND FISHERY HABITAT FROM THIS PROJECT AND THE PROPOSED PNF SALVAGE, FIRE SALVAGE AND GREEN TIMBER SALE PROJECTS AS SHOWN ABOVE. THE DRAFT EIS/EIR IS GROSSLY DEFICIENT FOR FAILING TO PROPERLY EVALUATE THE CUMULATIVE EFFECTS TO WATER QUALITY AND FISHERY HABITAT IN ALL WATERWAYS AFFECTED BY THIS PROJECT AND OTHER PROJECTS BEING PROPOSED BY THE PNF.

Nelson Creek Fishery and Water Quality

Some of the PNF Management Goals for the Nelson Creek watershed are as follows:

"Management Unit 1 (22% of Watershed)"

1. "To ensure that water quality will be within the standards set by the Sacramento Regional Water Quality Control Board, water quality will be monitored periodically at established locations on the Middle Fork Feather River and Nelson Creek."

CONCLUSION:

(7) THE DRAFT EIS/EIR DID NOT INCLUDE THE SITE SPECIFIC STATE WATER QUALITY STANDARDS AND OBJECTIONS FOR THE NELSON CREEK WATERSHED AND THE MIDDLE FORK FEATHER RIVER BASIN. THE DRAFT EIS-EIR ALSO DID NOT INCLUDE A SITE SPECIFIC WATER QUALITY MONITORING PLAN TO MONITOR THE INCREMENTAL EFFECTS TO WATER QUALITY FROM THIS PROJECT AND OTHER PNF MANAGEMENT ACTIVITIES [PROPOSED PNF TIMBER/SALVAGE SALE PROJECTS] IN THE NELSON CREEK WATERSHED, AND ALSO IN THE MFFR BASIN. THE DRAFT EIS/EIR IS DEFICIENT FOR THIS REASON.

(8) THE DRAFT EIS/EIR DID NOT CONTAIN SITE SPECIFIC WATER QUALITY MONITORING LOCATIONS FOR THIS PROJECT WHICH WILL ASSURE COMPLIANCE OF THE SACRAMENTO RIVER BASIN WATER QUALITY STANDARDS AND OBJECTIVES. THE DRAFT EIS/EIR IS DEFICIENT FOR THIS REASON.

"Management Unit 4 (44% of Watershed)"

1. "Maintain the existing productivity of the area. Utilize opportunities to harvest forest products without adverse effects on water quality, wildlife habitat and visual and cultural resources."

CONCLUSION:

(9) THE DRAFT EIS/EIR DID NOT COMPLY TO THIS MANAGEMENT GOAL BECAUSE THE DOCUMENT DID NOT EVALUATE THE DIRECT, INDIRECT AND CUMULATIVE EFFECTS ON WATER QUALITY AND FISHERY HABITAT IN THE NELSON CREEK WATERSHED, AND ALSO IN THE MFFR BASIN. THE DRAFT EIS/EIR IS DEFICIENT FOR THIS REASON.

"Management Unit 5 (18% of Watershed)"

1. "Provide maximum quantity and quality of forest products on a sustained yield basis while still providing protection to water quality, soil productivity, wildlife habitat and cultural resources."

CONCLUSION:

(10) THE DRAFT EIS/EIR DID NOT COMPLY TO THIS MANAGEMENT GOAL BECAUSE THE DOCUMENT DID NOT EVALUATE THE INCREMENTAL DIRECT, INDIRECT AND CUMULATIVE EFFECTS FROM THIS PROJECT [PROPOSED TIMBER/SALVAGE SALE PROJECTS] TO WATER QUANTITIES AND QUALITY, SOIL PRODUCTIVITY AND FISHERY HABITAT IN THE NELSON CREEK WATERSHED AND IN THE MIDDLE FORK FEATHER RIVER BASIN. THE DRAFT EIS/EIR IS DEFICIENT FOR THIS REASON.

According to the PNF Nelson Creek Water Quality Monitoring Plan, "intermittent sampling of the quality of Nelson Creek indicates that Nelson Creek is characterized by water of high quality. Dissolved solids and suspended sediment are low; water temperatures cool; and dissolved oxygen, well saturated. The high quality waters of Nelson Creek not only provide an ideal habitat for trout within Nelson Creek but also improves the trout habitat within the Wild and Scenic Middle Fork Feather River."

CONCLUSION:

(11) THE INCREMENTAL INCREASE TO SNOWFALL AND RAINFALL IN THE NELSON CREEK WATERSHED DUE TO THE RESULT OF THIS PROJECT DURING RUNOFF PERIODS MAY POTENTIALLY DEGRADE WATER QUALITY IN BOTH IN THE NELSON CREEK WATERSHED AND THE MFFR BASIN. AS STATED BEFOREHAND, THE DRAFT EIS-EIR DID NOT PROVIDE FOR A MONITORING PLAN TO MONITOR THE DIRECT, INDIRECT AND CUMULATIVE EFFECTS FROM THIS PROJECT AND OTHER PNF MANAGEMENT ACTIVITIES TO WATER QUALITY AND FISHERY HABITAT IN BOTH THE NELSON CREEK WATERSHED AND THE MFFR BASIN.

THE FINAL EIS-EIR SHOULD PROVIDE FOR A MONITORING PLAN WHICH IS CONSISTENT WITH THE PNF "NELSON CREEK WATER QUALITY MONITORING PLAN". THE RESPONSIBILITY OF FUNDING THIS MONITORING PLAN SHOULD BE PAID BY THE WATER CONTRACTORS ACTING THROUGH THE DWR.

According to the PNF Nelson Creek Water Quality Monitoring Plan, "Suspended Sediment - Suspended sediment concentrations can be critical to fish mortality and reproduction and can be significantly altered by land management activities. For trout, long chronic exposures to suspended sediment should not exceed 100 mg/l. This level produces some lethal pathology in rainbow trout."

CONCLUSION:

(12) THE DRAFT EIS-EIR DID NOT EVALUATE THE DIRECT, INDIRECT, AND CUMULATIVE INCREMENTAL EFFECTS FROM SUSPENDED SEDIMENT CAUSED BY THIS PROJECT AND OTHER PAST, PRESENT, AND FUTURE PNF MANAGEMENT ACTIVITIES IN THE NELSON CREEK WATERSHED.

WILL THE PROJECT AND OTHER PAST, PRESENT AND FUTURE PNF MANAGEMENT ACTIVITIES CAUSE SUSPENDED SEDIMENT TO CUMULATIVELY EXCEED 100 MG/L IN THE NELSON CREEK WATERSHED?

According to the PNF Nelson Creek Water Quality Monitoring Plan, "Turbidity - Turbidity is a measure of light penetration through water. Waters high in turbidity contain suspended particles, generally silts, clay, and organic materials which absorb light, reducing the amount of light penetration. Since turbidity is an indicator of silt and clay concentration, high turbidity can influence fish mortality, growth and reproduction. Also high turbidities can reduce aquatic growth which make up the base of the food chain."

CONCLUSION:

(13) THE DRAFT EIS-EIR DID NOT EVALUATE THE DIRECT, INDIRECT, AND CUMULATIVE INCREMENTAL ENVIRONMENTAL EFFECTS FROM TURBIDITY CAUSED BY THIS PROJECT AND OTHER PAST, PRESENT, AND FUTURE PNF MANAGEMENT ACTIVITIES IN THE NELSON CREEK WATERSHED.

WILL THE PROJECT AND OTHER PAST, PRESENT, AND FUTURE PNF MANAGEMENT ACTIVITIES INCREMENTALLY AFFECT TURBIDITY TO CUMULATIVELY CAUSE FISH MORTALITY AND AFFECT FISH GROWTH AND REPRODUCTION IN THE NELSON CREEK WATERSHED? IN THE MFFR BASIN?

WILL THE PROJECT INCREMENTALLY AND CUMULATIVELY CAUSE TURBIDITY TO CUMULATIVELY AFFECT AQUATIC GROWTH IN THE NELSON CREEK WATERSHED? IN THE MFFR BASIN?

According to the PNF Nelson Creek Water Quality Monitoring Plan, "Water Temperature - Air and water temperatures will be correlated to determine if water temperature increase increases are a result of land management activities or climatic fluctuations. Rainbow trout (the predominate species in Nelson Creek) generally desire a temperature of 7-10 degrees C. for spawning during April-June period, and populations drop with temperatures over 19 degrees C. June through October is generally the most critical period and intensive sampling will take place at that time."

CONCLUSION:

(14) WILL THE PROJECT INCREMENTALLY AND CUMULATIVELY AFFECT THE TIMING OF ADEQUATE WATER TEMPERATURE AND WILD TROUT SPAWNING CONDITIONS IN THE NELSON CREEK WATERSHED? IN WHAT SPECIFIC MANNER? PLEASE BE SPECIFIC.

WILL THE PROJECT INCREMENTALLY AND CUMULATIVELY AFFECT THE TIMING OF ADEQUATE WATER TEMPERATURE AND WILD TROUT SPAWNING CONDITIONS IN THE MFFR BASIN? IN WHAT SPECIFIC MANNER? PLEASE BE SPECIFIC.

According to the PNF Nelson Creek Water Quality Monitoring Plan, "Benthos Fauna - Benthos fauna are aquatic organisms found in the bottom substrates of bodies of water. These fauna are influenced by changes in bottom conditions (substrate), water quality, depth, temperature and velocity. Since they are not equipped to move great distances and thus remain at basically fixed locations their presence and diversity is an indicator of water quality."

"Since most have a life history of a year or more, they can indicate past and present changes in water quality. Bottom fauna production is also related to fish production and are widely used as an index of fish-carrying capacity in trout streams. Samples [Nelson Creek] will be collected with a Serber Sampler at a minimum of 4 locations as defined by Roby (1980). Samples will be sorted and keyed to at least the family level and analyzed as to biomass and diversity."

CONCLUSION:

(15) WILL THE PROJECT INCREMENTALLY AND CUMULATIVELY AFFECT BENTHOS FAUNA BY DEGRADING WATER QUALITY AND ACCELERATING RUNOFF IN THE NELSON CREEK WATERSHED? IN THE MFFR BASIN? PLEASE BE SPECIFIC.

According to the PNF Nelson Creek Water Quality Monitoring Plan, "Nitrate - Since nitrate is a chief biostimulant in natural waters and impacted by land management practices, it is important to monitor this nutrient to ensure it is not increased above natural background levels as a result of upstream management activities."

CONCLUSION:

(16) IN THE EVENT THIS PROJECT IS APPROVED BY THE PNF, WILL THE DWR MONITOR NUTRIENT CONDITIONS IN THE NELSON CREEK WATERSHED TO ENSURE IT IS NOT INCREASED ABOVE THE BACKGROUND LEVEL AS A RESULT OF THIS PROJECT AND THE PROPOSED PNF TIMBER/SALVAGE SALE PROJECTS.

WHAT IS THE PRESENT NUTRIENT BACKGROUND LEVEL IN THE NELSON CREEK [ALL TRIBUTARIES, INCLUDING MAIN STEM]? IN THE MFFR BASIN? [ALL TRIBUTARIES, INCLUDING MAIN STEM]?

According to the PNF Nelson Creek Water Quality Monitoring Plan, "Sampling Frequency - Sampling will be conducted throughout the year with emphasis placed on low flows and peak flows when physical and chemical parameters have their greatest impact on the aquatic biota. Ideally three samples will be taken during the spring melt period and four during low flows. Continuous sampling (one per hour) will be collected during one or two major storm events each winter." - "Additional samples will be taken following unseasonable climatic events., (flood, low flow extremes), management activities located adjacent to Nelson Creek and when notified of

a problem concerning water quality. The air-water recording thermograph will operate on a 30 day clock from July 15 through August and will be changed when samples are collected. Aquatic organisms will be sampled on or around July 15, each year."

CONCLUSION:

(17) IN THE EVENT THE PNF APPROVES THIS PROJECT, WILL THE DWR CONDUCT WATER QUALITY MONITORING SURVEYS IN ACCORDANCE WITH THE SCHEDULE IDENTIFIED IN THE PNF NELSON CREEK WATER QUALITY MONITORING PLAN?

Nelson Creek - PNF Standards and Guidelines

The standards and guidelines for the Nelson Creek watershed in management areas administered by the PNF in the PNF Forest Plan requires the following:

a) For projects affecting the Nelson Creek Wild Trout Stream, coordinate with the California Department of Fish and Game. Prepare and implement a Wild Trout Habitat Management Plan, Maintain sufficient flows in Nelson Creek to meet the needs of the Wild Trout fishery.

CONCLUSION:

(18) THE PNF FOREST PLAN REQUIRED THE DWR TO COORDINATE WITH THE DEPARTMENT OF FISH AND GAME (DFG) FOR PROJECTS AFFECTING THE NELSON CREEK WATERSHED. THE PROPOSED PROJECT AND OTHER PNF PAST, PRESENT AND FUTURE TIMBER/SALVAGE SALE PROJECTS WILL ALTER AND AFFECT WATER QUALITY IN THE NELSON CREEK WATERSHED AND ALSO IN THE MFFR BASIN. THE DRAFT EIS-EIR DID NOT SHOW WHETHER THE DWR CONSULTED WITH THE DFG PRIOR TO THE DOCUMENT BEING PREPARED AND SUBMITTED FOR PUBLIC REVIEW. ALSO THE FEDERAL U.S. FISH AND WILDLIFE COORDINATION ACT REQUIRED THE DWR TO CONSULT WITH THE DFG AND THE U.S. FISH AND WILDLIFE SERVICE. THE DRAFT EIS-EIR DID NOT SHOW THE DWR CONSULTED WITH BOTH THE DFG AND THE U.S. FISH AND WILDLIFE SERVICE.

WE BELIEVE THE FAILURE OF THE DWR TO COORDINATE AND CONSULT WITH THE DFG DURING THE PLANNING STAGE FOR THIS PROJECT VIOLATED THE PNF FOREST PLAN. WE ALSO BELIEVE THE FAILURE OF THE DWR TO CONSULT WITH THE DFG AND THE U.S. FISH AND WILDLIFE SERVICE DURING THE PLANNING OF THIS PROJECT WAS A VIOLATION OF THE U.S. FISH AND WILDLIFE COORDINATION ACT.

b) Prepare and implement a water quality monitoring plan for Nelson Creek.

CONCLUSION:

(19) The PNF Forest standards and guidelines required the PNF to prepare and implement a water quality plan for Nelson Creek to protect and improve

water quality. The proposed project will incrementally alter and affect water quality both directly, indirectly and cumulatively. The draft EIS-EIR did not include a water quality monitoring plan for this project which was approved by the PNF for the Nelson Creek watershed.

WE BELIEVE BEFORE THIS PROJECT IS APPROVED BY THE PNF, THERE MUST BE A WATER QUALITY MONITORING PLAN PREPARED AND IMPLEMENTED BY THE DWR AND THE PNF FOR THE NELSON CREEK WATERSHED TO DETERMINE THE DIRECT, INDIRECT AND CUMULATIVE EFFECTS TO WATER QUALITY AND FISHERY HABITAT FROM BOTH THIS PROJECT AND OTHER PNF MANAGEMENT ACTIVITIES [PROPOSED TIMBER/SALVAGE/FIRE SALVAGE SALE PROJECTS].

c) Employ Forestwide Standards and Guidelines for water, water use and need.

CONCLUSION:

(20) THE DRAFT EIS-EIR DID NOT SPECIFICALLY ADDRESS, EVALUATE AND IMPLEMENT THE FORESTWIDE STANDARDS AND GUIDELINES FOR WATER, WATER USE AND NEED. THIS IS A GLARING DEFICIENCY.

g) Evaluate operating plans to assure minimum disturbance to fish habitat, streamside vegetation, and scenic quality of Nelson Creek.

CONCLUSION:

21) THE PROPOSED PROJECT WILL INCREMENTALLY ALTER AND AFFECT FISH AND AQUATIC POPULATIONS AND HABITAT DIRECTLY, INDIRECTLY AND CUMULATIVELY IN ASSOCIATION WITH EXISTING AND: (a) PROPOSED MINING ACTIVITIES, (b) PROPOSED PNF TIMBER/SALVAGE/FIRE SALVAGE SALE PROJECTS AND (c) OTHER PNF MANAGEMENT ACTIVITIES. THIS WAS NOT ADDRESSED AND EVALUATED IN THE DRAFT EIS-EIR.

h) Close or temporarily close all roads for resource management near Nelson Creek.

CONCLUSION

22) THERE APPEARS TO BE ROADS ALONG THE NELSON CREEK WATERSHED WHICH MAY POTENTIAL CONTRIBUTE TO EROSION AND SEDIMENTATION PROBLEMS WHICH MAY AFFECT WATER QUALITY IN THE NELSON CREEK WATERSHED AND ALSO WATER QUALITY IN THE MFFR BASIN. THE PROPOSED PROJECT MAY INCREMENTALLY CONTRIBUTE TO INCREASED EROSION AND SEDIMENTATION BY THESE SAME ROADS. THIS WAS NOT ADDRESSED OR EVALUATED IN THE DRAFT EIS-EIR. PLEASE IDENTIFY AND EVALUATE THE ROADS WHICH MAY BE CAUSING EROSION AND SEDIMENTATION PROBLEMS IN THE NELSON CREEK WATERSHED [ALL TRIBUTARIES AND THE MAIN STEM].

Middle Fork Feather River - PNF Forest Plan Standards and Guidelines

The standards and guidelines for the Wild and Scenic Middle Fork Feather River in management areas administered by the PNF in the PNF Forest Plan requires the following:

- a) Manage the Wild, Scenic and Recreation Zones consistent with the Wild and Scenic Rivers Act. Employ the Rx-2 Prescription.

CONCLUSION:

(23) RX-2 PRESCRIPTION REQUIRED THE DWR AND PNF TO MINIMIZE SOIL LOSS AND IMPROVE WATER QUALITY IN THE MFFR TO CONTROL OR PREVENT EROSION THAT DAMAGES SCENIC QUALITY OR ENDANGERS WATER QUALITY AND THE FISHERY OF THE MFFR. THE PROPOSED PROJECT WILL INCREMENTALLY ALTER AND AFFECT WATER QUALITY IN THE MFFR. THE PROPOSED PROJECT WILL INCREMENTALLY AFFECT SOILS WHICH HAVE BEEN DISTURBED IN THE PROJECT AND EXTENDED PROJECT AREAS. THE PROPOSED PROJECT IN CONJUNCTION WITH OTHER PROPOSED PNF TIMBER/SALVAGE/FIRE SALVAGE SALE PROJECTS IN THE NELSON CREEK WATERSHED, AND ALSO IN THE MFFR WATERSHED, WILL CUMULATIVELY ALTER AND EFFECT WATER QUALITY AND FISHERY HABITAT IN THE MFFR, AND MAY ADVERSELY AFFECT WATER QUALITY AND FISHERY HABITAT IN THE MFFR.

THE DWR FAILED TO CONDUCT CUMULATIVE WATERSHED EFFECTS ANALYSES (CWEA) FOR THE NELSON CREEK WATERSHED AND THE MFFR WATERSHED (ALL TRIBUTARIES AND MAIN STEM). THE PNF IS REQUIRED TO CONDUCT CWEA'S FOR ALL PROJECTS AFFECTING WATER QUALITY IN THE PNF. THE DRAFT EIS-EIR IS DEFICIENT BECAUSE THE DWR DID NOT CONDUCT CWEA'S, AND INCLUDE THE RESULTS OF THESE ANALYSES IN THE DRAFT EIS-EIR. WITHOUT THESE CWEA ANALYSES THE DRAFT EIS-EIR IS GROSSLY DEFICIENT.

THE RX-2 PRESCRIPTION REQUIRES THE PNF TO WORK CLOSELY WITH THE REGIONAL WATER QUALITY CONTROL BOARD TO DETECT AND CONTROL POLLUTANT EMISSIONS AND SPILLS. THE DRAFT EIS-EIR DID NOT HAVE A CONTINGENCY PLAN TO PREVENT ADVERSE WATER QUALITY PROBLEMS FROM THE STORING AND SPILLING OF PROPANE INTO THE STATE'S WATERS IN THE PROJECT AND EXTENDED PROJECT AREA. CONSEQUENTLY THE DRAFT EIS-EIR IS NOT IN COMPLIANCE WITH THE FORESTWIDE STANDARDS AND GUIDELINES TO PROTECT AND IMPROVE WATER QUALITY AFFECTING THE MFFR AND OTHER WATERWAYS.

THE RX-2 PRESCRIPTION REQUIRES THE PNF, IN COOPERATION WITH THE REGIONAL WATER QUALITY CONTROL BOARD, TO ESTABLISH WATER QUALITY OBJECTIVES FOR THE MFFR THAT MEET FEDERAL STANDARDS. THE DRAFT EIS-EIR IS DEFICIENT BECAUSE IT FAILED TO IDENTIFY AND COMPLY TO THOSE OBJECTIVES AND STANDARDS FOR THE MFFR.

THE RX-2 PRESCRIPTION REQUIRES THAT NON-FEDERAL USES MUST HAVE PUBLIC BENEFIT, AND THAT THE PNF SHOULD ISSUE PERMITS FOR ACTIVITIES WITH PUBLIC BENEFIT IF COMPATIBLE WITH OTHER DIRECTIONS WITHIN THE RX-2 PRESCRIPTION. THIS PROJECT IS FOR NON-FEDERAL USES. WE BELIEVE THE PROPOSED PROJECT AND OTHER PROPOSED PNF TIMBER/SALVAGE SALE PROJECTS WILL CONFLICT WITH THE RX-2 PRESCRIPTION FOR THE MFFR.

b) Maintain the character of the Middle Fork Feather River semi-primitive areas. Employ the Rx-8 Prescription.

CONCLUSION:

(24) THE RX-8 PRESCRIPTION REQUIRES THAT THE PNF CAN ONLY ALLOW FACILITIES [THIS PROJECT] ONLY AFTER AN ANALYSIS DETERMINES THAT THE ESSENTIALLY UNDISTURBED CHARACTER OF THE AREA CAN BE RETAINED. AS CLEARLY SHOWN IN THIS LETTER OF COMMENT THE DRAFT EIS-EIR IS CLEARLY DEFICIENT AND HAS NOT DETERMINE, BY ANALYSIS (S), WHETHER THE PROPOSED PROJECT WILL NOT DISTURB THE CHARACTER OF THE SEMI-PRIMITIVE AREA BECAUSE OF RELATED AND ASSOCIATED INCREMENTAL AND CUMULATIVE WATER QUALITY AND SOIL MOVEMENT PROBLEMS AS A RESULT OF THE PROJECT.

THE RX-8 ALSO REQUIRES THE PNF TO REDUCE PREVENTABLE HUMAN CAUSED WILDFIRES. THE PROPOSED PROJECT HAS THE POTENTIAL TO CAUSE A WILDFIRE WHICH MAY HAVE FAR REACHING ADVERSE EFFECTS TO GREEN TREES AND THE FOREST ENVIRONMENT. THE PNF PRESENTLY HAS ABOUT 300,000 MILLION BOARD FEET OF DEAD AND DRYING TREES WHICH ARE A FIRE HAZARD.

THEREFORE WE URGE THE PNF BEFORE APPROVING THIS PROJECT TO DEVELOP A WRITTEN AGREEMENT WITH THE DWR WHICH REQUIRES THE DWR TO REPAY THE PNF FOR ALL DAMAGES TO THE FOREST ENVIRONMENT [PUBLIC LANDS AND RESOURCES] FROM WILDFIRES CAUSED BY THEIR FACILITIES [RECOVERY PLAN, GREEN TREES (PER BOARD FOOT-MARKET VALUE), REHABILITATION OF WATERSHEDS, IMPROVEMENTS FOR TROUT, WILDLIFE AND SPOTTED OWL HABITAT, AND PAYMENT FOR ALL PNF MAN HOURS].

Lake Basin Area

The Lakes Basin Management Area extends south of the Plumas-Eureka State Park to the Yuba-Feather River drainage divide (the Forest boundary) and is bound on the east by the Gold Lake Highway. Most of this management area is in Plumas County, but 2,658 acres are in Sierra County.

The Lakes Basin Area contains numerous small snow ponds and over twenty lakes, ranging in size from three acres to the 500 acre Gold Lake. Topography varies from the steep U-shaped Florentine Canyon in the northwest to a broad, flat glacial moraine in the southeast occupied by Snag and Goose Lakes. Valleys are separated by sharp peaks and ridges of

exposed rock. Elevations range from 5,200 feet in lower Gray Eagle Creek to 7,812 feet on top of Mt. Elwell, and most of the area is above 6,000 feet. Soils in the Basin Lakes Area are thin, rocky and generally highly erodible. The area is drained by Jamison, Smith, Gray Eagle, and Frazier Creeks, tributaries to the Wild and Scenic Middle Fork Feather River. Long Lake on Gray Eagle Creek provides domestic water for the town of Graeagle.

Vegetation in the area is sub-alpine and varies considerably from thick stands of red fir to dense brushfields with scattered Jeffrey pine on areas of shallow soil. Numerous small wet meadows and scattered stands of lodgepole pine and aspen are in the wetter areas. Pockets of mountain hemlock occur on the higher ridges and peaks, and western white pine is scattered throughout the area. The area has an equal diversity of wildlife habitat and species, with deer from the Sloat herd summering in the area. Most of the lakes and streams contain trout and are heavily fished. Spotted owl territories are included.

The Lakes Basin Area was established in 1926 by the Secretary of Agriculture, requiring that the area be used for recreation purposes and that other uses not impair the recreational values.

CONCLUSION:

(26) THE PROPOSED PROJECT COULD HAVE POTENTIAL INCREMENTAL ADVERSE EFFECTS TO THE PUBLIC RECREATION VALUES AND OPPORTUNITIES IN THE LAKE BASIN AREA BY EXTENDING THE WINTER SEASON [CAMPING-COLD WEATHER], CAUSING FLOODING, AFFECTING TRANSPORTATION AND ROAD CONDITIONS IN THE AREA, AFFECTING FISHING [TURBIDITY], CAUSING WILDFIRES CAUSED BY PROJECT OPERATIONS [PUBLIC SAFETY-PROPERTY], AND AFFECTING WATER QUALITY AND FISHERY HABITAT IN STREAMS AND LAKES WITHIN THE AREA.

WE BELIEVE THE SECRETARY OF AGRICULTURE INTENDED THE LAKE BASIN AREA TO BE AN AREA SOLELY USED FOR PUBLIC RECREATION, AND NOT AN AREA TO OPERATE WEATHER MODIFICATION FACILITIES [THIS PROJECT] WHICH MAY IMPAIR THE AREA. THEREFORE WE ARE REQUESTING THE U.S. FOREST SERVICE [SOLICITOR'S OFFICE] TO OBTAIN A WRITTEN LEGAL OPINION WHICH CLEARLY STATES THAT THIS TEST PROJECT AND THE LONG TERM PROJECT [50 PROPANE FACILITIES] ARE COMPATIBLE WITH THE FULL INTENT OF THE DIRECTIVE OF THE SECRETARY OF AGRICULTURE IN 1926, AND WILL NOT IMPAIR THE RECREATIONAL VALUES OF THE AREA. PLEASE INCLUDE THE SOLICITOR'S OPINION IN THE FINAL EIS-EIR.

The standards and guidelines for the Lakes Basin Management Area are administered by the PNF in the PNF Forest Plan as following:

a) Maintain the Lakes Basin Recreation Area by employing the Rx-5 and Rx-6 Prescriptions.

CONCLUSION:

(27) THE RX-5 PRESCRIPTION REQUIRES THE PNF TO PROTECT RECREATIONAL VALUES IN THE LAKE BASIN RECREATION AREA AND IT DOES NOT ALLOW THE HARVESTING OF TIMBER WITHIN THE LAKE BASIN AREA. CLEARLY THE RX-5 PRESCRIPTION WAS DEVELOPED BY THE PNF CONSISTENT WITH THE INTENT OF THE SECRETARY OF AGRICULTURE AS NOTED ABOVE. THEREFORE, AS STATED BEFOREHAND, A LEGAL OPINION FROM THE U.S. FOREST SERVICE SHOULD BE MADE BEFORE THIS PROJECT IS APPROVED BY THE PNF.

b) The Rx-5 Prescription requires the implementation of the Forestwide Standards and Guidelines in the PNF Forest Plan.

CONCLUSION:

(28) THE FORESTWIDE STANDARDS AND GUIDELINES REQUIRES THE PNF TO PROTECT HIGHLY SENSITIVE WATERSHEDS THRU CUMULATIVE IMPACT PLANNING. THE DWR DID NOT CONDUCT CUMULATIVE WATERSHED EFFECTS ANALYSES FOR SENSITIVE STREAMS WITHIN THE PROPOSED PROJECT AND EXTENDED PROJECT AREAS. THE DRAFT EIS-EIR IS GROSSLY DEFICIENT FOR FAILING TO COMPLY TO CUMULATIVE IMPACT PLANNING AS REQUIRED BY THE PNF FOREST PLAN.

(29) THE FORESTWIDE STANDARDS AND GUIDELINES REQUIRES THE PNF TO PRESERVE WATERSHED CONDITIONS SO THAT SOIL PRODUCTIVITY AND WATER QUALITY ARE MAINTAINED. THE FORESTWIDE STANDARDS AND GUIDELINES REQUIRES THE PNF DURING PROJECT ACTIVITIES TO MINIMIZE EXCESSIVE LOSS OF ORGANIC MATTER AND LIMIT SOIL DISTURBANCE ACCORDING TO THE EROSION HAZARD RATING (EHR). THE DWR DID NOT CONDUCT "EHR'S" FOR THE PROJECT AND EXTENDED PROJECT AREAS. THE DRAFT EIS-EIR IS NOT IN COMPLIANCE WITH THE FORESTWIDE STANDARDS AND GUIDELINES FOR FAILING TO CONDUCT EHR'S AND IS DEFICIENT FOR THIS REASON

30) THE FORESTWIDE STANDARDS AND GUIDELINES REQUIRES THE PNF TO PROTECT PUBLIC SAFETY AND FOREST RESOURCES FROM SLOPE FAILURE, AND TO AVOID OR PROVIDE SPECIAL TREATMENT OF UNSTABLE AREAS TO AVOID TRIGGERING MASS MOVEMENT. THE DRAFT EIS-EIR DID NOT PROVIDE FOR SPECIAL TREATMENT OF UNSTABLE AREAS TO AVOID TRIGGERING MASS MOVEMENT INCREMENTALLY CAUSED BY THIS PROJECT. THEREFORE THE DRAFT EIS-EIR IS NOT IN COMPLIANCE WITH THE FORESTWIDE STANDARDS AND GUIDELINES MAKING THE DRAFT EIS-EIR DEFICIENT.

(30) THE FORESTWIDE STANDARDS AND GUIDELINES REQUIRES THE PNF TO APPLY FORESTWIDE STATE OBJECTIVES TO MUNICIPAL SUPPLY WATERSHEDS AND WHEN PLANNING PROJECTS WITHIN THESE WATERSHEDS TO PERFORM HYDROLOGIC SURVEYS AND ANALYSES, AND THEREAFTER MONITOR FOR COMPLIANCE WITH BMP'S.

THE PROPOSED PROJECT, AND PAST, EXISTING AND PROPOSED PNF TIMBER/SALVAGE/FIRE SALE PROJECTS WILL CUMULATIVELY ALTER AND AFFECT WATER QUALITY IN THE MFFR BASIN CAUSING ADDITIONAL SEDIMENT TO BE CARRIED AND DEPOSITED INTO OROVILLE RESERVOIR. ALSO THE NORTH FORK FEATHER RIVER, SOUTH FORK FEATHER RIVER, WEST BRANCH OF THE FEATHER RIVER, AND MANY OTHER TRIBUTARIES CARRY AND DEPOSIT SEDIMENT INTO OROVILLE RESERVOIR.

OROVILLE RESERVOIR IS PART OF THE STATE WATER PROJECT AND PROVIDES WATER FOR SWP WATER CONTRACTORS WHO ARE FUNDING THIS PROJECT. THE DEPOSITING OF SEDIMENT INCREMENTALLY INTO OROVILLE RESERVOIR WHICH WILL BE CAUSED BY THIS PROJECT AND OTHER PNF AND PRIVATE LAND MANAGEMENT ACTIVITIES WILL ALTER AND AFFECT STORAGE CAPACITY IN OROVILLE RESERVOIR, AND WITHIN TIME, WILL BE SIGNIFICANT ENOUGH TO REDUCE STORAGE CAPACITY OF THE RESERVOIR. THIS IN TURN WILL AFFECT THE WATER USERS WHO ARE USING SWP WATER, AND WHO ARE PROPOSING THIS PROJECT.

THE DRAFT EIS-EIR DID NOT INCLUDE THE RESULTS OF HYDROLOGIC SURVEYS AND ANALYSES WHICH EVALUATES THE CUMULATIVE EFFECTS TO OROVILLE RESERVOIR FROM THE EFFECTS OF SEDIMENTATION CAUSED INCREMENTALLY BY THIS PROJECT AND OTHER PAST, PRESENT AND FUTURE PNF AND PRIVATE LAND MANAGEMENT ACTIVITIES IN ALL WATERSHEDS FLOWING INTO OROVILLE RESERVOIR. THE DRAFT EIS-EIR IS DEFICIENT FOR THIS REASON.

c) The Rx-6 Prescription requires the implementation of the Forestwide Standards and Guidelines in the PNF Forest Plan.

CONCLUSION:

(32) THE LOCATIONS OF THE PROPANE DISPENSERS FOR THIS PROJECT ARE LOCATED NEAR AND ADJACENT TO THE PACIFIC CREST TRAIL (PCT). THE DRAFT EIS-EIR STATES THAT MOST SITE LOCATIONS WILL BE LOCATED IN REMOTE AREAS AWAY FROM WINTER USE ACCESS AREAS. THE DRAFT EIS-EIR ALSO STATES THAT THE PROPANE DISPENSERS WILL BE IN PLACE DURING PERIODS OF LOW RECREATIONAL USE MINIMIZING POTENTIAL CONTACT WITH RECREATIONALISTS, AND THAT DISPENSERS WILL BE DIFFICULT TO LOCATE WITHOUT SPECIFIC DIRECTIONS. THE DRAFT EIS-EIR FURTHER STATED THAT ALL DISPENSERS WILL BE PAINTED WHITE TO BLEND IN WITH THE SNOW BACKGROUND, AND THAT BY USING AN APPROVED FOREST SERVICE FIRE PLAN AND BY TRANSPORTING THE FILLED TANKS OVER TERRAIN AWAY FROM ANY POPULATED REGIONS, PUBLIC SAFETY WILL NOT BE JEOPARDIZED. (OUR EMPHASIS)

ALL OF THE TEN POTENTIAL SITES FOR THE PROPANE DISPENSERS WILL BE LOCATED IN AREAS ALLOCATED FOR SEMIPRIMITIVE MANAGEMENT BY THE PNF. THE RX-6 PRESCRIPTION REQUIRES COMPLIANCE OF THE FORESTWIDE STANDARDS AND GUIDELINES. THE FORESTWIDE STANDARDS AND GUIDELINES UNDER VISUAL RESOURCES REQUIRES THE PNF TO MAINTAIN VISUAL QUALITY ALONG THE PCT AND TO EMPLOY A V.Q.O. OF "PARTIAL RETENTION" IN THOSE AREAS VIEWED AS

FOREGROUND FROM THE PCT, AND ALLOW A V.Q.O. OF "MODIFICATION" IN THE MIDDLE AND BACKGROUND.

DWR SHOULD PREPARED A VISUAL QUALITY PLAN WHICH USES THE VISUAL MANAGEMENT SYSTEM (VMS) TO ENSURE THAT THE PROPOSED PROPANE SITES WILL NOT EFFECT HIKERS USING THE PCT, AND ALSO AFFECT SKIERS AND SNOWMOBILES WHO USE THE RIDGETOPS FOR WINTER RECREATION. THE DRAFT EIS-EIR DID NOT HAVE A VISUAL QUALITY PLAN USING THE VMS REQUIREMENTS AND OBJECTIVES. AS STATED IN THE PNF VMS [APPENDIX K- PNF FOREST PLAN], THIS PROCESS INVOLVES INVENTORY, ANALYSIS, AND THE DETERMINATION OF VISUAL MANAGEMENT OBJECTIVES AND PROVIDES FOR THEIR INPUT INTO AN INTEGRATED RESOURCES PLANNING AND DECISION MAKING PROCESS.

THE DRAFT EIS-EIR IS DEFICIENT BECAUSE IT FAILED TO INCLUDE A VISUAL QUALITY PLAN TO PROTECT THE PCT AND THE SEMIPRIMITIVE AREA.

(33) THE DRAFT EIS-EIR DID NOT EVALUATE THE SITE SPECIFIC EFFECTS TO RECREATIONALISTS WHO USE THE RIDGETOPS AND SLOPES FOR SKING AND SNOWMOBILING WHERE THE PROPANE DISPENSERS WILL BE LOCATED. THERE IS A POTENTIAL PUBLIC SAFETY PROBLEM BECAUSE SKIERS AND SNOWMOBILE USERS COULD POTENTIALLY BE INJURED SHOULD THEY ACCIDENTLY RUN INTO THESE FACILITIES DURING RECREATIONAL PERIODS IN THE WINTER. ALSO THE DIRECT CONTACT OF PROPANE MIST FROM THE DISPENSERS COULD POTENTIALLY AFFECT THE HEALTH AND WELL BEING OF SKIERS AND SNOWMOBILE USERS. ALSO THERE IS THE POTENTIAL THAT ADDITIONAL SNOWFALL CAUSED BY THE PROJECT COULD INCREMENTALLY CREATE AVALANCHES HAVING ADVERSE EFFECTS TO PUBLIC SAFETY.

THE DRAFT EIS-EIR DID NOT EVALUATE THE EFFECTS TO PUBLIC SAFETY AND PUBLIC HEALTH DURING THE WINTER PERIODS WHEN SKIERS AND SNOWMOBILE USERS ARE USING THE RIDGE TOPS AND SLOPES FOR RECREATIONAL ACTIVITIES. THE EIS-EIR IS DEFICIENT FOR THIS REASON.

d) Maintain the character of the Gold Lake semi-primitive area by employing the Rx-8 Prescription. The Rx-8 requires the maintenance of high visual quality and adequate treatment of damages from catastrophic events. The Rx-8 Prescription also requires the implementation of the Forestwide Standards and Guidelines in the PNF Forest Plan.

CONCLUSION:

(34) AS STATED BEFOREHAND, THE DWR SHOULD BE REQUIRED TO COMPENSATE THE PNF FOR ANY DAMAGES TO PUBLIC PROPERTY FROM DAMAGES CAUSED BY A PROJECT CAUSED WILDLIFE.

Forestwide Standards and Guidelines

The Forestwide Standards and Guidelines in the PNF Forest Plan requires the following:

Visual Resources - "Preservation" - "Allow for ecological changes only. Preclude management activities except for recreation facilities, with low visual impact."

Visual Resources - "Retention" - "Provide a natural-appearing landscape where management activities are not visually evident."

Visual Resources - "Partial Retention" - "Provide a natural-appearing landscape where management activities remain visually subordinate."

Visual Quality Objectives - "Meet V.Q.O.'s by applying techniques described in publications listed in Appendix K."

Visual Quality - "Maximum Modification" - "Employ a V.Q.O. of "Partial Retention" in those areas viewed as foreground from the PCT [Pacific Crest Trail], and allow a V.Q.O. of "Modification" in the middle and background."

Wildlife, Fish and Sensitive Plants - "Trout" - "Improve and protect habitat for trout" - "Ensure that trout habitat quality and quantity are not reduced by streamflow altering activities such as hydroelectric projects."

Wildlife, Fish and Sensitive Plants - "Wild Trout Streams" - "Continue to manage portions of Yellow Creek, Nelson Creek, and the Middle Fork Feather River as Wild Trout Streams. See Management Area Direction for areas [Management] 4,8,9, 10, 12, 14, 18, 19, 24, 25, and 33, and Prescription Rx-2."

Riparian Areas - "Favor riparian dependent resources and limit disturbance in all riparian areas including riparian and aquatic ecosystems, wetlands, streambanks, and flood plains." - "Favor riparian resources over other resources, except cultural resources in cases of conflict. Apply Rx-9 Riparian Area Prescription. Also see standards and guidelines for "Water"."

Water - Water Quality - "Maintain or, where necessary, improve water quality using BMP's (10a, 11a) - "Implement FS Best Management Practices to meet water quality objectives and maintain and improve the quality of surface water on the Forest. Identify methods and techniques for applying the BMP's during project planning and incorporate them into the associated project plan and implementation document (See Plan Appendix Q)."

Water - Water Quality - Municipal-Supply Watersheds - "Apply Forest-wide water quality objectives (i.e. State objectives) to municipal-supply watersheds (10a)" - "Through the use of BMP's keep water quality at a level that will allow a safe and satisfactory supply when given reasonable treatment by the purveyor. - "When planning projects within these watersheds, perform hydrologic surveys and analyses, and thereafter monitor for compliance with BMP's."

Water Uses and Needs - "Assure an adequate water supply for PNF and instream needs(10a)." - "Conduct a Water use; Needs, and Availability Survey where stream diversions or flow changes are proposed, except for FERC-regulated projects for which intensive studies are required. Allow new consumptive use only of those waters surplus to current uses, future PNF needs, and needed instream flows. Base conclusions for Class I, II, and III streams on Instream Flow Incremental Methodology (IFIM) or comparable method approved by the Forest Service."

Watershed Protection - "Preserve watershed conditions so that soil productivity conditions and water quality are maintained." - "Protect highly sensitive watersheds thru cumulative impact planning and rehabilitate highly disturbed watersheds." - "Complete the Watershed Improvement Needs Inventory (WIN) and update annually by identifying all lands contributing to watershed degradation thru analysis of NFS watersheds on a priority basis and by individual project assessment. Analysis and mitigation on a total watershed basis, not only on project areas." - "At the project planning level, assess cumulative watershed impacts within 3rd order or smaller watersheds. If the cumulative disturbance is at or near a threshold of causing disproportionate damage, limit additional disturbance by deferring activities and/or by rehabilitation."

Channel Maintenance and Flood Control - "Protect life and property from flooding and stream channel degradation where threat is moderate to high."

Soil - "Prevent significant or permanent impairment of soil productivity." - "During project activities, minimize excessive loss of organic matter and limit soil disturbance according to the Erosion Hazard Rating (EHR)." - "Develop specific soil evaluation and mitigation measures for each project site as needed."

Soil - "Eliminate excessive soil loss" - Develop and apply erosion control plans to road construction, mining, recreation development, and other site disturbance projects. Develop specific mitigation measures for each project site as needed." - "Conduct Order II Soil Surveys by timber compartments to help predict the need for soil protection measures." - "Document observations of slope failure, significant erosion of and from road surfaces, erosion of mine spoils, and any other sources of sediment that are affecting water quality or channel stability. Use for future erosion control planning."

Air Quality - "Adjust activities to prevent violations of air pollutant standards."

Geology - "Protect public safety and Forest resources from slope failure." - Avoid or provide special treatment of unstable areas to avoid triggering mass movement." - Use the PNF Land Stability Risk Classification data for preliminary assessment of instability problems on all projects

which disturb the land surface. Provide geotechnical evaluation of projects with a moderate or higher potential to initiate or accelerate landslides." - "Allow no land disturbing activities on extremely unstable land unless a geotechnical investigation determines certain activities are appropriate. - "Prevent loss of groundwater quality and quantity - Conduct a geotechnical assessment of all ground water development projects or any other project which might adversely impact the groundwater table."

Lands - Special Uses and Corridors - "Allow for land uses by the private sector or other agencies thru permits, if compatible with Management Area Direction, use of other lands is not feasible, environmental impacts are mitigated, and the public interest is protected."

Facilities Other Than Roads - "Comply with requirements of the Federal Water Pollution Control Act, as amended by the Clean Water Act, and all requirements of Federal, State and local agencies governing public water systems and the disposal of wastewater."

Fire and Fuels - "Manage fuels to reduce high risk hazard and/or to facilitate cost-efficient resource protection." - "Clearly define water quality objectives in Burn Plans. Develop, as part of these Plans, mitigation measures to be used where riparian and water quality standards and guidelines cannot be met." - Develop guides for the use of unplanned ignitions, implementation subject to Regional Forester approval."

Law Enforcement - "Protect resources and provide for safety of the public and employees." - "Maintain a Forest Law Enforcement Plan that prescribes actions to eliminate or acceptably reduce law enforcement problems, especially illegal occupancy, timber theft, and incendiary fire." (OUR EMPHASIS)

CONCLUSION

(34) THE DRAFT EIS-EIR IS NOT IN COMPLIANCE WITH MANY OF THE ABOVE STATED FORESTWIDE STANDARDS AND GUIDELINES. THE FINAL EIS-EIR SHOULD COMPLY FULLY TO THESE STANDARDS AND GUIDELINES BEFORE THE PNF APPROVES THIS PROJECT. PLEASE NOTE THE UNLINED ITEMS OF CONCERN.

Deficiencies in Draft EIS-EIR - Under Environmental Issues

A. Long Term Impacts (Page 36)

The draft EIS-EIR fails to have site specific information and data. Without site specific information the conclusion reached in the "Long Term Impacts" section is deficient.

B. Short Term Impacts (Page 37)

The draft EIS-EIR fails to have site specific information and data. Without site specific information the conclusion reached in the "Short Term Impacts" section is deficient.

D. Extra Area Effects (Page 39)

The draft EIS-EIR fails to have site specific information and data. Without site specific information the conclusion reached in the "Extra Area Effects" section is deficient.

E. Air Quality (Page 40)

The draft EIS-EIR fails to have site specific information and data on air quality in the basin. Without site specific information and data the cumulative impacts from site specific and cumulative hydrocarbon sources may adversely affect public health in both Plumas and Sierra Counties. Therefore the conclusion reached in the "Air Quality" section is deficient.

F. Water Resources (Page 42)

The draft EIS-EIR fails to have site specific information and data on rain-snow level, length of winter, snowpack, extent of delayed snowmelt, ground water, avalanches, runoff, floods, water use, and downwind precipitation depletion in the "project area" and "extended project area". Without site specific information and data the cumulative impacts from site specific and cumulative sources may potentially adversely affect rain-snow level, length of winter, snowpack, extent of delayed snowmelt, ground water, avalanches, runoff, floods, water use, and downwind precipitation depletion in the "project area" and "extended project area". Therefore the conclusion reached in the "Air Water Resources" section in the draft EIS-EIR is deficient.

G. Erosion (Page 46)

The draft EIS-EIR fails to have site specific information and data on erosion in the "project area" and "extended project area". Without site specific information and data the cumulative impacts from site specific and cumulative erosion sources may potentially adversely affect water quality and fishery habitat. Therefore the conclusion reached in the "Erosion" section in the draft EIS-EIR is deficient.

G.4. Potential Cumulative Effects (Page 48)

The draft EIS-EIR fails to have site specific information and data on watersheds, water quality, soils, erosion, fish and aquatic life, runoff, floods, ground water, avalanches, water use, endangered and threatened animals, aesthetic values and transportation. Without site specific

information and date the conclusion reached on cumulative effects in the "Potential Cumulative Effects" section in the draft EIS-EIR is grossly deficient.

H. Water Quality (Page 49)

The draft EIS-EIR fails to have site specific information and data on water quality. Without site specific and cumulative information and data the conclusion reached in the "Water Quality" section is grossly deficient.

I. Plant Communities (Page 49)

No comment.

J. Rare Plant (Page 51)

The conclusion reached in the draft EIS-EIR is sufficient in that it was based on site specific project suveryrs.

K. Wildlife (Page 52)

The draft EIS-EIR fails to have site specific information and data on wildlife species and habitat. Changes in the weather pattern within the "project area" and extended project area" may potentially affect wildlife life stages (all) and habitat. Without site specific information the conclusion reached in the "Wildlife" section is deficient.

L. Fish and Aquatic Life (Page 52)

This section of the draft EIS-EIR is grossly deficient. The DWR relies on workshops conducted on the Medicine Bow Project. Again, both NEPA and CEQA require site specific information and data (studies) for the "project area" and the "extended project area" in the PNF.

Also this section fails to identify the fish species and habitat in specific river and streams within the "project area" and the "extended project area" which may potentially be adversely affected as a result of water quality problems caused by this project by direct, indirect, and cumulative effects.

M. Endangered and Threatened Animals (Pages 52-53)

Simply listing the threatened and endangered species and making generalized comments in the draft EIS-EIR concerning their habitat is not sufficient to identify site specific associated impacts from the project in the "project area" and the extended project area" of the PNF. Changes in the weather pattern within the "project area" and "extended project area" may potentially adversely affect these species life stages (all) and habitat. Without site specific information and data (studies) the conclusion reached

in this section is deficient because of potential modification of their habitat which may jeopardize these species and their habitat.

N. Cultural Resources (Pages 53-54)

No. Comment because site specific surveys were conducted.

O. Aesthetic Values (Page 54)

The location and operation of the propane dispensers may potential adversely affect users of the Pacific Crest Trail and users of the Lake Basin area and the semi-primitive area. This section does not evaluate the site specific potential adverse effects to users and potential adverse effects to visual quality in these areas during the post project operation period. NEPA and CEQA requires site specific information and data (studies).

P. Transportation (Page 55)

This section fails to provide site specific studies which determines the effects and alterations to traffic patterns from this project. Though the CHP and Cal Trans may have conducted studies in the Sierra Nevada, - site specific studies should have been conducted and included in this draft EIS-EIR as evidence which show there will be no effect to traffic patterns and the public who use the roadways in the "project area" and the extended project area". Therefore this section is deficient.

Q. Safety (Page 56)

This section is deficient in many areas. The proposed project will incrementally increase flooding during flooding events. This section fails to have site specific information and data (studies) which determines the potential site specific adverse effects to public safety and property from flooding events both in Plumas County within the "project area" and the "extended project area", and also in the Feather River below Oroville Dam.

R. Fire Hazard (Pages 56-57)

This section does have the necessary mitigation measures to prevent potential fire hazards from occurring from project operations. Also, the draft EIS-EIR did not evaluate the potential adverse effects to dead and drying trees in the PNF from a project caused fire.

S. Regulation and Consistency with Other Planning Documents (Page 57)

The California Health and Safety Code requires the DWR or its agent for this project to file a Hazardous Material Inventory Plan with either Plumas or Sierra Counties, or both, to protect ~~the health~~ and safety of persons, property, or the environment in Plumas and Sierra Counties. This plan was not included in the draft EIS-EIR. The final EIS-EIR should contain a copy of this plan with an explanation showing how the plan will protect public health and safety and the environment.

National Environmental Policy Act (NEPA)

Section 1500.1 (a) of the CFR 40 states as follows in part:

"The National Environmental Policy Act (NEPA) is our basis national charter for protection of the environment. It establishes policy, sets goals (section 101), and provides means (section 102) for carrying out the policy. Section 102(2) contains "action forcing" provisions to make sure that federal agencies act according to the letter and spirit of the Act. The President, the federal agencies, and the courts share responsibilities for enforcing the Act so as to achieve the substantive requirements of section 101."

Section 1500.1 (b) of the CFR 40 states as follows in part:

"NEPA procedures must insure that environmental information is available to public officials and citizens before decisions are made and before actions are taken. The information must be of high quality. Accurate scientific analysis, expert agency comments, and public scrutiny are essential to implementing NEPA."

Section 1502.9 (a) of the CFR 40 states as follows:

"Draft environmental impact statements shall be prepared in accordance with the scope decided upon in the scoping process. The lead agency shall work with the cooperating agencies and shall obtain comments as required in Part 1503 of this chapter. The draft statement must fulfill and satisfy to the fullest extent possible the requirements established for final statements in section 102(2)(C) of the Act. If a draft statement is so inadequate as to preclude meaningful analysis, the agency shall prepare and circulate a revised draft of the appropriate portion. The agency shall make every effort to disclose and discuss at appropriate points in the draft statement all major points of view on the environmental impacts of the alternative including the proposed action."

Section 1502.9 (b) of the CFR 40 states as follows:

"Final environmental impact statements shall respond to comments as required in PART 1503 of this chapter. The agency shall discuss at appropriate points in the final statement any responsible opposing which was not adequately discussed in the draft statement and shall indicate the agency's response to the issues raised."

Section 1502.9 (c)(1)(i) of the CFR 40 states as follows:

(c) "Agencies:"

(1) "Shall prepare supplementals to either draft or final statements if:

(i) There are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts."

Section 1508.7 of the CFR 40 describes cumulative impacts as follows:

"Cumulative Impact" is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal-non-Federal) or person undertakes such other action. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."

Section 1508.8 (a)(b) of the CFR 40 describes effects as follows:

"Effects" include:

(a) "Direct effects which are caused by the action and occur at the same time and place."

(b) "Indirect effects, which are caused by the action and are later in time or further removed in distance, but are still reasonably foreseeable. Indirect effects and other effects related to induced population density or growth rate, and related effects on air and water and other natural systems, including ecosystems."

"Effects and impacts as used in these regulations [Part 1500 et seq CFR 40] are synonymous. Effects includes ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. Effects may also include those resulting from actions which may have both beneficial and detrimental effects, even if on balance the agency believes that the effects will be beneficial."

CONCLUSION:

It is clearly evident that the draft EIS-EIR failed to analyze the incremental direct, indirect, and cumulative effects to the forest land and water environment from this project, and also from proposed PNF salvage projects, fire salvage projects and green timber sale projects, and past activities. Clearly the draft EIS-EIR is grossly deficient and violates numerous provisions of the Section 1500 et seq of the CFR 40.

California Environmental Quality Act (CEQA)

A draft EIR must identify and focus on the possible significant environmental impacts of a proposed project. (Guidelines, Section 15126, subd. (a) Section 21000, subd. (a)) The greatest emphasis should be placed on those impacts that are most significant and most likely to occur. The analysis should clearly identify both direct and indirect impacts, as they occur both in the short-term and long-term. It should also discuss the environmental specifics of the affected environment; the resources involved; anticipated physical changes and any potential related health and safety problems; anticipated alterations to ecological systems; and probable resulting changes in population distribution and concentration, the human use of the land (including commercial and residential development), and other aspects of the resource base such as water, scenic quality, and public services. (Guidelines, Sections 15126, subd. (a), 15143.)

A Draft EIR must discuss "cumulative impacts" when they are significant. (Guidelines, Section 15130, subd. (a).) These are defined as "two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts. (Guidelines, Section 15355; see also Section 21083, subd. (b).) "[i]ndividually effects may be changes resulting from a single project or a number of separate projects." (Guidelines, Section 15355, subd. (a).) "The cumulative impacts from several projects is the change in the environment which results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time." (Guidelines, Section 15355, subd. (b).)

A legally adequate "cumulative impact analysis" thus is an analysis of a particular project viewed over time and in foreseeable probable future projects whose impacts might compound or interrelate with those of the project at hand. Such an analysis "assesses cumulative damage as a whole greater than the sum of its parts." (Environmental Protection Information Center v. Johnson (1985) 170 Cal. App. 3d 604, 625 [216 Cal.Rptr. 502, 515].) Such an analysis is necessary because "[t]he full environmental impact of a proposed....action cannot be gauged in a vacuum." (Whitman v. Board of Supervisors (2d Dist. 1979) 88 Cal. App. 3d 397, 408 [151 443 F. Supp. 866, 872], quoting Akers v. Resor (W.D. Tenn. 1978) 443 F.

Supp. 1355, 1360.) " '[A]n agency may not.....[treat] a project as an isolated 'single shot' venture in the face of persuasive evidence that it is about one of several substantially similar operations.....To ignore the prospective cumulative harm under such circumstances could be to risk ecological disaster.'" (Whitman, supra, 88 Cal.App.ed at 408 [151 Cal. Rptr. 866, 872], quoting Natural Resources Defense Council v. Callaway (2d Cir. 1975) 524 F.2d 79, 88.)

Unless cumulative impacts are analyzed, agencies tend to commit resources to a course of action before understanding its long term impacts. This, a proper cumulative impacts analysis must be prepared 'before a project gains irreversible momentum.' (City of Antioch v. City Council (1st Dist. 1986) 187 Cal.App.3d 1325, 1333 [232 Cal.Rptr. 507, 511], citing Bozung v. Local Agency Formation Commission (1975) 13 Cal.3d 263, 282 [118 Cal. Rptr. 249, 262].)

One court has described as follows the danger of approving projects without first preparing adequate cumulative impact analyses:

"The purpose of this requirement is obvious: consideration of the effects of a project or projects as if no others existed would encourage the piecemeal approval of several projects that, taken together, could overwhelm the natural environment and disastrously overburden the man-made infrastructure and vital community services. This would effectively defeat CEQA's mandate to review the actual effect of the projects upon the environment." (Las Virgenes Homeowners Federation, Inc. v. County of Los Angeles (2d Dist. 1986 177 Cal 3d. 300, 306 [223 Cal. Rptr. 18, 23].)

Like every aspect of CEQA, "[t]he requirement for a cumulative impact analysis must be interpreted so as to afford the fullest possible protection of the environment within reasonable scope of the statutory and regulatory language." (Citizens to Preserve the Ojai v. Board of Supervisors (1985) 176 Cal. App.3d 421, 431-432 [222 Cal. Rptr. 247, 253], citing Friends of Mammoth v. Board of Supervisors (1972) 8 Cal.3d 247, 259 [104 Cal. Rptr. 761, 771].)

In Citizens to Preserve the Ojai, the courts explained that " 'It is vitally important that an EIR avoid minimizing the cumulative impacts. Rather, it must reflect a conscientious effort to provide public agencies and the general public with adequate and relevant detailed information about them.' [Citations] A cumulative impact analysis which understates information concerning the severity and significance of cumulative impacts impedes meaningful public discussion and skews the decisionmaker's perspective concerning the environmental consequences of a project, the necessity for mitigation measures, and the appropriateness of project approval. [Citation] An inadequate cumulative impact analysis does not demonstrate to an apprehensive citizenry that the governmental decisionmaker has in fact fully analyzed and considered the environmental consequences of its

action." (Citizens to Preserve the Ojai, supra, 176 Cal App.3d at 431 [222 Cal Rptr. 247, 252-253]).

The terms "past, present and reasonably anticipated future projects" include not only projects currently under environmental review." Some projects may be "reasonably foreseeable" even though they may never be built. What matters is whether they appear foreseeable at the time of EIR preparation. (City of Antioch, supra, 187 Cal.App.3d at 1337 [232 Cal.Rptr. 507, 515.]

The California Supreme Court interpreted CEQA for the first time in 1972, in the landmark case Friends of Mammoth v. Board of Supervisors (1972) 8 Cal.3d. 247 [104 Cal. Rptr. 761]. That decision announced that CEQA must be interpreted so "as to afford the fullest possible protection to the environment within the reasonable scope of the statutory language" and that environmental analysis is required not only for projects initiated by government, but also for agency actions, such as the approval or issuance of permits, leases, and other entitlements, taken in response to private initiatives. (8 Cal. 3d at 259, 262 [104 Cal.Rptr. 761, 768, 771].)

CONCLUSION:

It is clearly evident that the draft EIS-EIR failed to analyze the incremental direct, indirect, and cumulative effects to the forest land and water environment from this project and also from proposed PNF salvage projects, fire salvage projects and green timber sale projects, and past activities. Clearly the draft EIS-EIR is grossly deficient and is in violation of the CEQA guidelines requirements.

FINAL CONCLUSION

As clearly shown in this letter of comment, and as stated beforehand, the draft EIS/EIR for the proposed project is grossly deficient as written, is in violation of NEPA, is in violation of CEQA, is not in compliance with the standards and guidelines in the PNF Forest Plan, and conflicts with State Policy regarding the Nelson Creek watershed and the Wild and Scenic Middle Fork Feather River Basin.

Recommendation

This project will provide a net amount of 21,000 acre-feet of water annually for use by out-of-county water contractors using the State Water Project. The catchment basin for this project lies within Plumas and Sierra Counties. This catchment basin acts as a giant reservoir for this project and conveys water to the Oroville Facility of the State Water Project. Plumas and Sierra Counties have "county of origin rights" under the California Water Code and other applicable statutes. This year the DWR purchased 150,000

acre-feet of water from the Yuba County Water Agency (Yuba County) at a rate of \$45.00 per acre foot [6.75 million dollars) for water contractors using State Water Project water.

We recommend the Water Contractors acting through the DWR should fully compensate both Plumas and Sierra counties for water produced by this project. The two counties should be compensated for 21,000 acre-feet of water annually at a rate of \$45.00 per acre foot [\$945,000.00] [Proportional to county areas within the project catchment basin], provided this project is environmentally acceptable, and provided that an adequate Final EIS-EIR is approved for this project which is in compliance with the requirements of the NEPA, the CEQA requirements, and the requirements of the PNF Forest Plan.

Please provide this writer and Mr. Jackson at the address listed below with a copy of the final EIS-EIR and the decision notice by the Forest Supervisor of the PNF.

Thank you for the opportunity to provide comments to you concerning the draft EIS-EIR for this project.

Respectfully Submitted



Robert J. Baiocchi, Executive Director, CSPA
Michael Jackson, Counsel, CSPA & FPW
P.O. Box 357
Quincy, CA 95971

For: CSPA and Friends of Plumas Wilderness

cc: Ms. Mary J. Coulombe, Forest Supervisor
Responsible Federal Official
Plumas National Forest
U.S. Forest Service
P.O. Box 11500
Quincy, CA 95971

Mr. Larry Mullnix, Deputy Director
Responsible State Official
California Department of Water Resources
1416 Ninth Street
Sacramento, CA 95814

Mr. R.C. Bennett, Forest Planner
Responsible Planner and Environmental Officer
Plumas National Forest
U.S. Forest Service

Mr. Robert Hammond, District Ranger, Beckwourth Ranger District
Mr. Charles Smay, District Ranger, La Porte Ranger District
Mr. Jeff Withroe, Milford Ranger District
Mr. Terry Beniot, Water Quality Biologist
Ms. Leslie Mink, Fisheries Biologist
Plumas National Forest

Mr. John Preschutti, Friends of Plumas Wilderness

Mr. Bill Jennings, Chairman of the Board, CSPA

Mr. Jim Crenshaw, President, CSPA

Dr. Tom Sharles, Conservation Chairman, NCCFFF, CSPA Board

Mr. Larry Hampy, President, SWCFFF, CSPA Board

Mr. Jerry Bliss, SWCFFF and CSPA Board

Mr. Gary Widman, Trout Unlimited and CSPA Board

Plumas and Sierra Counties

Interested Parties

Response to comments from Mr. Robert Baiocchi, Executive Director,
California Sportfishing Protection Alliance:

The EIS/EIR was written to conform with requirements of both NEPA and CEQA. The cloud seeding project was developed in consultation with Plumas National Forest planning officers to assure compliance with all standards and guidelines of the PNF Forest Plan. Other State and federal agencies that were consulted, which includes the California Department of Fish and Game, are listed in the Final EIS/EIR.

Mr. Baiocchi's comments reflect an assumption that because the enhanced snow fall and snow melt would occur over a large area, the EIS/EIR must provide a detailed, site specific analysis of every location where the snow would fall. This EIS/EIR was prepared following an interpretation of CEQA that a site specific analysis must be provided where the project would cause special, unusual, or more intense impacts than in other areas. Accordingly, the EIS/EIR provides site specific analyses of the sites of the propane dispensers. The impacts of the additional increment of snow fall and snow melt resulting from this project would be so widely dispersed and so difficult to detect in any particular location that the EIS/EIR used a general description of those impacts. This approach should be adequate to provide the reviewing public a good understanding of the impacts.

Mr. Baiocchi's comments suggest that everything in the area is part of a cumulative impact. We believe that the effects of the cloud seeding project are different from the logging activities which Mr. Baiocchi listed as the main contributors to erosion of soil and turbidity in streams. The main human activities contributing to erosion in the forest are the disturbance of soil and the exposure of bare soil to the erosive effects of rapid runoff. This project will disturb the soil only where the supports are emplaced to hold the propane tanks and other equipment. These areas will be small. Because they will be located on the ridgetops, they will receive little runoff from

lands upslope from them. We expect no significant erosion impacts from the emplacement of the propane tanks directly, indirectly, or cumulatively.

The main forces of erosion in the project area are: 1) the impacts of individual raindrops falling on exposed soil; 2) the rapid flow of runoff across areas of exposed soil; and 3) peak, high velocity flows in streams swollen by rainfall. We believe that the project will not cause any of these forces to become more severe.

The purpose of this project is to test equipment that is intended to increase snowfall and thereby increase the snowpack. The equipment will be operated only under conditions that would yield snowfall rather than rain. The Department has little interest in increasing rainfall in the Feather River drainage. Most of the runoff from rainfall comes during the winter when the U. S. Army Corps of Engineers flood control requirements keep water storage in Lake Oroville low so there is space to handle flood flows. If runoff from a storm increases storage in Lake Oroville above the level allowed by the Corps, that water is released as soon as it can be done safely to make room to control the flood from the next storm.

When spring arrives, the Corps of Engineers flood control requirements are gradually relaxed allowing the Department to store more water. Flows coming during April, May, and June are the most valuable to the Department from a water supply point of view because it is during this time that the Department can fill the reservoir and hold the water for water supply purposes. These flows come mostly from snow melt.

The Department believes that snow melt has a minimal erosion effect when compared with rainfall. Most of the erosion from rainfall comes from the heavy winter rains. These rains have large raindrops that disturb exposed soil with their impacts. They produce great volumes of water flowing rapidly across the ground eroding areas of bare soil. The heavy runoff gets into the

streams quickly causing high peaks in the flows. These peak flows are the main ones that cause streambank erosion. Streams swollen by winter rains normally carry muddy, brown water.

In contrast, snowflakes do not have an erosion impact. They land gently and normally on other snowflakes. They stay where they land. When the snow melts, it normally does so slowly. Runoff even from the most rapid snowmelt occurs more slowly than occurs from the heavy winter rains. Water from snowmelt flowing across the forest floor normally flows slowly and flows clear. Streams swollen by snowmelt also run clear, carrying little sediment.

The Department believes that the minor increase in snowfall and in resulting snowmelt caused by this project would not contribute to the rainfall-caused erosion to which Mr. Baiocchi's comment refers. Nor would the snowmelt aggravate conditions in wild trout streams. The snowmelt would contribute to sustained flows during normal and below normal years. The project would be suspended during above normal snow years. The project would not contribute to winter rain.

The Plumas National Forest Land and Resource Plan states that facilities can be allowed in semiprimitive areas following analyses that show that the essentially undisturbed character can be retained. The EIS/EIR was prepared to analyze environmental effects from the proposed project. No effects that would significantly effect the essentially undisturbed character of the area were identified.

Wild and scenic designation protects streams by preventing activities that adversely effect the free-flowing condition and natural character. Streams are designated in the "California Protected Waterway Plan" or as a "wild trout stream" due to exceptional water quality that provides excellent habitat for naturally reproducing trout. The proposed cloud seeding program does not conflict with these designations or management plans since no diversions or impoundments are proposed, and no adverse

effects to the fishery, water quality, or the natural character of the streamside environment are anticipated.

The proposed project will increase precipitation during years of normal or below normal precipitation, but within the natural range of variation. Since precipitation will be within the normal range for the area, the project will not create any effects that do not naturally occur. Increased precipitation in the form of snowfall, rather than rainfall, will result in less soil impacts, and hence not foster increased erosion. The benefits from the proposed project are water supply augmentation, improved forest vigor through increased soil moisture and decreased loss of vegetation and timber, improved wildlife habitat as a result of improved forest vigor, and improved aquatic habitat through increased duration of base stream flows.

The U. S. Forest Service has completed a Soil Resource Inventory of all soil types that includes erosion hazard ratings for the Plumas National Forest. The effects on erosion from snowpack augmentation was discussed in detail in the EIS/EIR (pages 51 through 54). This discussion concludes that snowpack augmentation will not have a significant effect on erosion. The targeted watersheds were stated to be in stable condition. Snowpack augmentation would extend the period of runoff, rather than leading to increases in runoff peaks which contribute to increased erosion and suspended sediment transport. The slow water release associated with snowmelt would have little erosional or sediment carrying capacity. Though a variety of factors in the targeted area may contribute to erosion, enhanced runoff from this project during below normal to normal years is not expected to increase erosion within the project watershed due to the extent and duration of the project, the relative stability within the primary enhancement area, and a lack of contribution to peak flows. The proposed project will contribute to erosion reduction by enhancing and sustaining plant growth.

NEPA and CEQA require discussion of cumulative impacts of closely

related projects only if they are considered to be significant. Effects from other activities in the watershed are discussed in the EIS/EIR to the extent that the proposed project creates effects in the project area. Effects in the watershed from the proposed project were considered to be insignificant.

As discussed above, snowpack augmentation results in extension of the period of runoff, rather than increases in peak flows. Extended base flows do not contribute to increased erosion or sediment carrying capacity. Snowpack augmentation will not create runoff greater than the normal range for the area, which also limits the significant effects. Also, the proposed project will not produce additional erosional sources since soils will not be disturbed.

The number of miles of existing and old roads causing erosion and sedimentation in the project area have not been catalogued, nor have erosion rates from such areas been determined. For the reasons explained previously, the Department believes that these existing erosion problems are caused by conditions and forces not related to this project. Incremental increases to erosion, as discussed above, are expected to be insignificant. The Department will establish a monitoring program to evaluate erosion and water quality effects from the proposed project.

Forest operations, including green and salvage timber sale projects and mining activities, require development of Best Management Practices to prevent adverse effects of erosion and to protect water quality and wildlife habitat. Any salvage of timber due to effects of drought or fire will require detailed erosion control plans. Such plans, and runoff patterns associated with snowmelt, would reduce any adverse effects due to timber sale projects to insignificant levels. Snowpack augmentation would reduce the loss of trees to drought in future years, thus contributing to reduction of soil disturbance activities.

One of the purposes of this prototype project is to assess

environmental effects of snowpack augmentation. Both project specific and cumulative effects to water quality, including nutrient levels and indicator organisms, will be considered in monitoring programs developed in conjunction with the U. S. Forest Service. Erosion rates from typical areas and effects on water quality will be determined during watershed monitoring.

The Nelson Creek watershed is described in the Final EIS/EIR in Appendix C. As discussed previously, the snowpack augmentation project does not conflict with the wild trout designation since no adverse effects to trout or their habitat are anticipated. Increased water yield from snowpack augmentation will contribute to sustained flows, rather than erosive peak flows, which will benefit trout and other aquatic organisms by increasing and enhancing habitat conditions in Nelson Creek and the Middle Fork Feather River downstream from the confluence of Nelson Creek. Any proposed timber sales in the Nelson Creek watershed must comply with Best Management Practices to prevent adversely affecting the aquatic resources.

This EIS/EIR has, in part, been tiered on the Skywater FEIS and the Medicine Bow Ecology Project. NEPA and CEQA encourage the tiering of environmental impact statements and reports to eliminate repetitive discussions. The proposed project relies heavily on the results of the research programs of these two projects to develop an effective and socially acceptable cloud seeding technology. This project also relies on the data and conclusions obtained from the 10-year Sierra Cooperative Pilot Project just completed on the American River and Tahoe-Truckee drainages in the Sierra Nevada mountains, and on information provided by the U. S. Forest Service Central Sierra Snow Laboratory in the upper reaches of the American River basin.

The Water Quality Control Plan (Basin Plan) for the Central Valley Regional Water Quality Control Board, adopted March 31, 1989, does not include site specific standards or objectives for the Nelson Creek drainage. The Basin Plan includes general objectives for

waters tributary to the Sacramento and Feather Rivers, with a specific maximum objective of 150 μ mhos/cm for electrical conductivity in the Middle Fork of the Feather River from Little Last Chance Creek to Lake Oroville. The Basin Plan prohibits alteration of suspended sediment loads and turbidity that would cause nuisance or adversely affect beneficial uses. Since snowpack augmentation is expected to contribute to maintenance of base flows rather than highly erosive runoff peaks, the proposed project is not expected to exceed objectives in the Basin Plan. The water quality monitoring program that will be implemented for this pilot project will determine conformance to Basin Plan objectives.

Neither trout or benthic fauna are expected to be adversely affected by the proposed project. Runoff will not be accelerated, but will sustain base flows for a slightly longer period. Suspended sediment and turbidity levels are not expected to be significantly increased. Water quality will be maintained, and improved in the Middle Fork Feather River from additional flow from Nelson Creek. Water temperatures will not be elevated, but will be maintained at cooler temperatures associated with snowmelt for a slightly longer period than would naturally occur during years of below normal precipitation. Stream temperatures will remain within historic, natural variations.

The Feather River, emanating from the Plumas and Lassen National Forests, is the source of water for the Oroville Facilities of the State Water Project. The Department concurs with the Plumas National Forest forest wide standards and guidelines for water, water use, and need. The State of California has similar guidelines and standards. The proposed project has been developed to comply with the standards and guidelines in protecting visual quality, wildlife, habitat, water quality, flood and erosion control, air quality, and other forest resources.

The EIS/EIR states that all propane dispensers will be painted white to blend with the snow background and lessen visual and

aesthetic impacts. The remote placement of the dispensers away from winter use areas will further minimize visual effects. Temporary placement of the dispensers during the winter months, when few hikers and other recreationists use these mountaintops, results in minimal visual impacts. Visual impacts will be compensated by the recreation afforded from increased snowpack for winter uses. Post-project aesthetic effects will not occur, since all equipment will be removed each spring.

A Hazardous Material Spill Contingency Plan, which is required by the California State Health and Safety Code for storage or use of hazardous materials, has been developed to prevent adverse effects to water quality from storing or spilling of propane. This plan will be filed with the Environmental Health Officers in Plumas and Sierra Counties when permits for the project are issued. Fire hazard associated with the use of propane was discussed in detail in the EIS/EIR on pages 63 and 64. The potential hazard from fire was considered to be remote. A Fire Hazard Response Plan has been prepared, and will be filed with both counties upon issuance of permits.

The proposed project will not result in significant adverse effects to public recreation values or opportunities in the Lakes Basin area. Suspension criteria have been incorporated into the project to prevent flooding. Water quality, including turbidity, will not be affected since snowpack augmentation is expected to result in increases in base flow rather than peak flow. Snowpack augmentation does not affect the length of winter, though ground temperatures may remain cooler than normal during the extended period of snow cover. Studies have shown snowmelt to be delayed only for a few days due to snowpack augmentation. The Gold Lake Highway is not maintained by the California Department of Transportation in winter following the first major snow storm. At most, a delay in re-opening the road of a few days in spring may occur.

The U. S. Forest Service has evaluated land stability and

developed risk maps for the Plumas National Forest. The proposed project is not expected to increase hazards associated with slope failure or avalanches. Landslides are the consequences of strains that gradually build up as the result of geomorphic processes continuing over a very long period of time. Unless these strains are artificially relieved, a landslide is inevitable. The mechanism that initiates a landslide only affects the timing of release. Landslides may be initiated by earthquakes, heavy rain or snow accumulations, erosion, or a combination of these factors (Project Skywater Final EIR). Accumulations of rain and snow are a factor only when unfrozen soil becomes deeply waterlogged, usually as a consequence of a long period of heavy precipitation. Operational criteria and limitations provide for suspension of snowpack augmentation under conditions that would produce heavy rain and consequent flood risk that would contribute to landslide danger. Likewise, suspension criteria, which limit snowpack accumulation, are intended to prevent formation of conditions that could lead to avalanche occurrence.

Public safety in the project area will not be affected. Use of an approved Forest Service Fire Plan, standard industry practices for propane handling, and transport of propane tanks away from populated regions will protect public safety. Fire hazard from use of propane, as discussed on page 63 and 64 of the EIS/EIR, will be minimal. Warning signs posted on and in the vicinity of the propane tanks will deter recreationists. As discussed on pages 44 through 46 of the EIS/EIR, propane use in the project area is not likely to adversely affect any recreationists. Propane will only be released during harsh winter snow storms that are not conducive to recreational pursuits. Turbulent air movement on the ridge locations will rapidly mix and dilute the propane released from nozzles about 12 feet above ground level. Liquid propane will vaporize to a gas within about 20 inches from the nozzle, and be carried with the turbulent air currents.

The Department is aware of the sediment inflow to Oroville Reservoir. The reservoir design allowed a dead storage space for

this sediment inflow. This space can accept sediment inflow equal to the average sediment inflow for the next 100 years without adversely affecting live storage in the reservoir. The proposed project is not expected to significantly contribute to sediment inflow to Oroville Reservoir since sediment production from the incremental increase in runoff, as discussed above, is not expected to be significant.

The EIS/EIR described both past and present uses in the project area, and provided a detailed description of the effected environment (page 37). No "long term impacts" were identified to the project area. Short term impacts in the project area were identified as land-disturbance or aesthetic. Land-disturbance impacts will be minimized by replacing disturbed soils to original conditions. Aesthetic impacts result from helicopter flights over roadless areas for very brief periods in November and again in May for placement and retrieval of snowpack augmentation equipment and measuring devices, and sightings of on-site equipment by recreationists, as discussed previously. Extra area effects beyond the project area are significant only for alternative 1, which would use silver iodide as a seeding agent. Alternative 1 will not be used for this snowpack augmentation program. The preferred alternative (alternative 2) would minimize extra area effects since ice crystals, which form within inches of the nozzles, would only be carried by winds short distances before falling out as snowfall. The monitoring program developed for this prototype project will enable determination of extra area effects.

The EIS/EIR noted that little air quality data are available in the project area, but is impacted from sources to the southwest. Air quality was considered to be high. The report further noted that propane generated by the project will oxidize to form water and oxides of nitrogen at low concentrations which will not effect air quality. These substances will be rapidly dissipated by turbulent air movements.

The EIS/EIR discusses rain-snow level, length of winter, snowpack, extent of delayed snowmelt, ground water, avalanches, runoff and floods, water use, and downwind precipitation depletion in the project and extended project areas on pages 46 through 51. No significant effects were identified.

Effects on erosion in the project area are discussed on pages 51 through 54. No measurable direct effect on erosion from an augmented snowpack within the project area is expected, as discussed previously.

The EIS/EIR provides information on the watershed (pages 28 to 29), water quality (pages 54 to 55, and Appendix C), soils (pages 33 to 34), erosion (pages 51 to 54), fish and aquatic life (pages 35 and 57 to 58), runoff and floods (pages 48 to 49, and Appendix D), ground water (page 47), endangered and threatened animals (pages 58 to 59), aesthetic values (pages 60 to 61), and transportation (pages 61 to 62). Information is provided concerning effects from cloud seeding in other areas to determine the potential for adverse effects to the project area. No significant adverse effects were identified. Monitoring conducted for this project will provide additional information on water quality, soils, erosion, fish and aquatic life, and runoff and floods.

Conclusions about project effects on wildlife (page 57), including endangered and threatened animals (pages 58 to 59), were based on observations from other cloud seeding projects. Most effects on wildlife were found to be positive, primarily by providing improved habitat conditions. Weather patterns will not be changed in the project or extended project areas, and precipitation and snowpack will be within normal ranges for the areas. Therefore, adverse effects on various life stages and habitat of wildlife, including endangered and threatened animals, are not anticipated.

As discussed on pages 61 and 62 of the EIS/EIR, the small incremental increase of snowfall per hour from snowpack

augmentation will not be sufficient to adversely effect transportation or highway snow removal. Therefore, no changes in traffic patterns are expected from this project.

Flooding is discussed on page 62 of the EIS/EIR. Suspension criteria are incorporated into the project which will minimize risk. The criteria provide for suspension of cloud seeding activities during anticipated or possible flood conditions in the project and downstream areas.

Mr. Baiocchi recommended that the Department compensate Plumas and Sierra Counties for the additional water produced by the project. Such compensation is neither authorized nor required by existing law. The area of origin laws allow people in the counties of origin to develop additional water supplies to meet their needs even if those new water supplies would take water away from the State Water Project. The laws do not call for payment of compensation to the counties for the water originating as precipitation within their boundaries. In any event, the recommendation deals with legal and financial matters which by themselves do not raise environmental issues under the California Environmental Quality Act.

2120 N Callow Ave
Bremerton, WA 98312-2908
June 12, 1990

California Department of Water Resources
Attn: R.D. Lallatin, Project Manager
P.O. Box 607
Red Bluff, CA 96080

Dear Sirs

Thank you for the opportunity to comment on the Draft Environmental Impact Statement / Environmental Impact Review for the Prototype Project to Augment Snow Pack by Cloud Seeding Using Ground Based Dispensers Plumas and Sierra Counties, Plumas National Forest and State of California.

I believe that alternative 2 should be the preferred alternative.

Page 40, para E, 2, subpara 1 states that the release rate for the propane will be less than 3 gallons per hour. Page 41, para E, 2, subpara 3 states release will be less than 3 gallons per hour. Page 41, para E, 2, subpara 4 states the release will be at 2 1/2 gallons per hour. I realize that it says basically the same thing, but why not just use one figure?

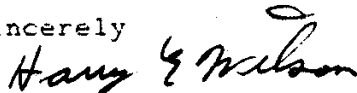
How will the seeding dispensers be painted? The propane tanks will be white but they will be removed during the summer period. Sites 1, 5, and 8 are close to the Pacific Crest Trail and the dispensers needs to blend into the background.

On Page 85 it says insert map, where is the map?

Will the precipitation gauges be painted to blend into the background for summer and winter times?

Thank you for your time and consideration.

Sincerely



Harry E Wilson
2120 N Callow Ave
Bremerton, WA 98312-2908

Response to comments from Mr. Harry Wilson:

The preferred alternative is alternative 2.

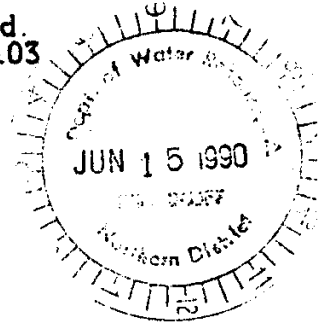
The release rate of propane is between $2\frac{1}{2}$ and 3 gallons per hour.

The propane tanks and dispensers will be painted white, and will be removed in early spring. The dispensers and tanks will be on the ridgetops from November to April or May. During that time, white will be a good color for blending into the background. The precipitation gauges will be painted earth colors. This painting scheme and site specific locations to take advantage of natural physiographic features will result in very little visual impact from the Pacific Crest Trail.

Lynn Douglas
380 Johnsville Rd.
Blairsden, CA 96103
Ph. 836-2234

June 13, 1990

California Department of Water Resources
Attention: R.D. Lallatin, Project Manager
P.O. Box 607
Red Bluff, CA 96080



RE: Prototype Propane Project, Plumas and Sierra Counties

Dear Sir,

I will address three major areas of concern respecting the proposed propane seeding project in the Plumas National Forest.

First, the only documented testings of propane as a seeding agent sited are Vardiman (1971) and Hicks and Vali (1973). Seventeen years have apparently elapsed without further testing in a time of great concern over lack of precipitation. More recent documented testing would seem natural and the lack opens this project to questions of scientific credibility and public responsibility.

Second, I drove over Gold Lake Road overlooking the area concerned yesterday and can see little evidence of a remaining snow pack. The Johnsville P.U.D. is finding less water coming from fewer springs. I submit that the targeted area for this project is materially on the shadow side of the Sierra containing little that can be considered real snow pack areas. The rejection of the use of silver iodide as a seeding agent sites the fact that it requires -50C or colder temperatures while propane requires just below freezing. So according to the Declaration (p.42) one half of the outfall will fall as rain below 4,500 ft. and the rest will be created in a near freezing and barely freezing atmosphere which means they will be seeding WARM rather than the cold storms claimed. Spring flooding and loss of snowpack will result causing serious erosive and drought effects on the rivers and forest.

Third, I live in Johnsville and have followed this project closely. The initial project was carelessly planned and carelessly administered. Mr. Nelson of the State Park had to complain that the helicopters were flying over mountain slope just above the town. Now I see this is corrected in the current declaration but the danger was clear from the outset. The promise to have fire fighting equipment at the ready on the Johnsville Ski Area parking lot was not honored and when questioned Mr. Lallatin answered that the Park fire truck was 'ready' a mile below at the State Park. It is not clear that this ancient vehicle could make it up to the Ski Area and I doubt if it or its crew is equipped to handle or advise on procedures for safe propane transfer. I feel there has been an adversary position on the part of Mr. Lallatin and his department rather than one of cooperation and public responsibility.

Sincerely,

Lynn Douglas
F-62

c.c. Forest Service

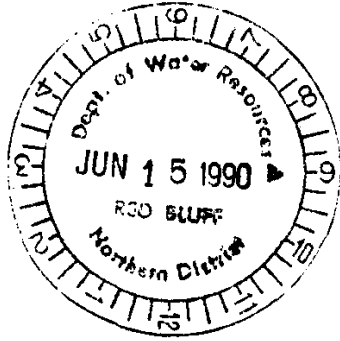
Response to comments from Lynn Douglas:

During the winter seasons of 1988-89 and 1989-90, propane dispensers were designed, fabricated, and tested on private property near the Sierra crest in Sierra County. The released propane dramatically increased snowflakes during the testing. The purpose of this prototype program is to determine the viability of snowpack augmentation using propane.

The 1989-90 winter produced below average precipitation in most of California. Little remaining snowpack during mid-June is indicative of the drought situation.

The EIS/EIR states that temperatures of the Sierra Nevada winter storms are fairly mild, with supercooled liquid water at temperatures just below freezing. Propane is more efficient than silver iodide at producing ice crystals, and hence snowflakes, at the temperatures found in the Sierra Nevada mountains. Release of propane will cool the temperature in the vicinity of the nozzles to -40 °F, forming ice crystals which will grow to snowflakes in the presence of additional supercooled water. The snowline is expected to be about the 4,500 foot elevation. About half of the precipitation at the 4,500 foot elevation (not half the output from cloud seeding) will be as rainfall. Eighty-five (85) percent of the precipitation from the cloud seeding program is expected to fall at higher elevations as snow.

The EIS/EIS states that State, local, and USFS approved fire prevention measures will be used in handling the propane for this project. A Fire Hazard Response Plan will be filed with appropriate agencies once permits are issued for this project.



Melissa Sheets
346 Johnsville Road
Blairden, California
96403

June 13, 1990

Dear Mr. Gallatin,

I am concerned about the proposed use of propane cloud seeding in our area. The outcome is not known. Propane is a pollutant and will fall from the sky in the form of rain or snow into our streams and lakes. We humans as well as the wild life drink surface water. The fact that our air is so clean does not justify the introduction of 'a little' pollution.

I'm also concerned that if the seeding works as either rain or snow how will areas farther down the path of the winter storms be affected. Will they be robbed of badly

needed rain or snow? No
area is less important
because of sparse population
or vegetation.

Experimenting with nature
without regards to health
and safety to the environment
has proven a disaster in the
past and is not an effective
way of 'fixing' something that
is in part a result of
abuse.

Sincerely,

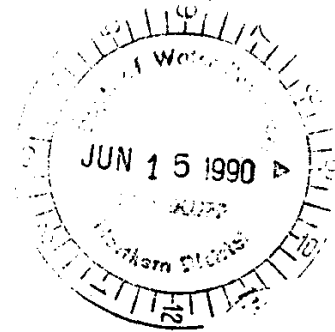
Melina Smith

Response to comments from Ms. Melissa Sheets:

The propane will be released during storms, a time when air quality is not a problem. There are no State or federal ambient air quality standards for propane. The EIS/EIR noted that propane generated by the project will oxidize to form water and oxides of nitrogen, but at low concentrations which will not effect air quality. These substances will be rapidly dissipated by turbulent air movements that are characteristic of storms.

The EIS/EIR cites a nine year study by the U. S. Bureau of Reclamation, Division of Atmospheric Water Resource Management Group, of large scale effects of cloud seeding. No evidence was found to support the theory that stimulation of precipitation in one area deprived another area.

MICHAEL B. JACKSON
ATTORNEY AT LAW
446 W. MAIN ST. — P.O. BOX 207
QUINCY, CALIFORNIA 95971
(916) 283-1007



June 13, 1990

Mr. R.D. Lallatin, Project Manager
Department of Water Resources
P.O. Box 607
Red Bluff, CA 96080

Re: Draft Joint Environmental Impact Statement/Environmental Impact Report for the Proposed Prototype Project To Augment Snowpack by Cloudseeding Using Ground Based Dispensers in Plumas and Sierra Counties, California. Comments to Draft EIS/EIR submitted by Gayle Laurel, resident of Plumas County.

Dear Mr. Lallatin:

Due to pressing time-lines involved in my work as a paralegal I have not had sufficient time to prepare a detailed letter regarding the Draft EIS/EIR, therefore I wish to be represented by the letter that Mr. Baiocchi sent your agency for the California Sportsfishing Protection Alliance, Friends of Plumas Wilderness and Michael Jackson. Mr. Baiocchi's presentation of the issues was thorough and represent my concerns.

Please send me a copy of your responses to Mr. Baiocchi and retain my name on a list of those opposed to the Draft EIS/EIR on the grounds that Bob has detailed.

Sincerely,

A handwritten signature in cursive script, appearing to read 'Gayle Laurel'.

Gayle Laurel
P.O. Box 1731
Quincy, CA 95971
(916) 283-1007 (work)

cc: Court Bennet, Forest Planner
Responsible Planner and Environmental Officer
Plumas National Forest
U.S. Forest Service

Plumas County Board of Supervisors

Sierra County Board of Supervisors

Response to comments from Gayle Laurel:

These comments have been noted.



UNITED STATES
DEPARTMENT OF THE INTERIOR
OFFICE OF THE SECRETARY

Office of Environmental Affairs
Box 36098 - 450 Golden Gate Avenue
San Francisco, California 94102
(415) 556-8200

June 15, 1990

ER90/446

R. D. Lallatin, Project Manager
Department of Water Resources
State of California
P. O. Box 607
Red Bluff, CA 96080

Dear Mr. Lallatin:

The Department of the Interior has reviewed the draft joint environmental impact statement/report for the Prototype Project to Augment Snowpack by Cloudseeding Using Ground Based Dispensers, Plumas National Forest, Plumas and Sierra Counties, California and has no comments.

However, because there are other existing or proposed cloudseeding programs in California that would involve units of the National Park system, the National Park Service would be interested in receiving any reports on the results of this research project. Their address is:

National Park Service
Western Region
450 Golden Gate Avenue, Box 36063
San Francisco, CA 94102

Thank you for the opportunity to review this document.

Sincerely,

Patricia Sanderson Port
Regional Environmental Officer

cc: Director, OEA (w/orig. incoming)
Reg. Dir., BR
Reg. Dir., NPS

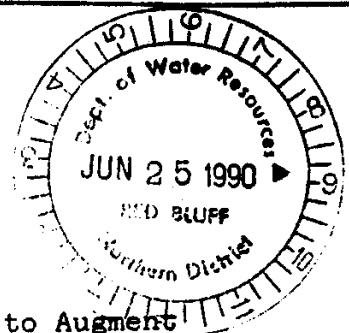
Response to comments from Ms. Patricia Port, Department of the
Interior:

The National Park Service has been placed on the mailing list to
receive reports on the results from this project.

**PLUMAS COUNTY
COMMUNITY DEVELOPMENT COMMISSION**

June 20, 1990

Department of Water Resources
P. O. Box 607
Red Bluff, CA 96080



ATTENTION: Mr. Dick Lallatin

RE: Draft EIS - Prototype Project to Augment
Snowpack by Cloud Seeding Using Ground Based
Dispensers. Plumas & Sierra Counties

Dear Dick Lallatin:

Various studies accomplished in the last few years particularly:

- * "East Branch North Fork Feather River Erosion Inventory Report" (SCS, 1989),
- * "1989 Riparian Initiative Assessment Report for Last Chance Watershed" (USFS-PNF, 1990), and
- * 1990 Water Quality Assessment (State Water Resources Control Board, 1990)

have shown a whole range of degradations on the East Branch North Fork Feather River (EBNFFR). These degradations are evidenced by erosion rates ranging from 660 tons per square mile (Squaw Queen) to 1,110 tons per square mile (Middle Indian & Last Chance Creeks) [SCS].

Indian Creek's channel area, in Genesee Valley, has increased from 88 acres in 1941 (101 feet wide) to 263 acres in 1987 (324 feet wide).

Indian Creek's channel in Indian Valley has increased from 68 acres in 1941 (80 feet wide) to 300 acres in 1987 (294 feet wide). (All figures SCS.)

This level of problems within the East Branch, North Fork has led to the continuing efforts of the EBNFFR Coordinated Resource Management group to understand and improve the watershed. DWR & USFS have been important participants in this ongoing process.

The Draft EIS (p. 3) shows a project and extended area that includes many of these degraded watersheds.

I believe that Potential Cumulative Effects discussion (p. 48) does not address (nor mention) the potential cumulative effects on the EBNFFR within the project and extended area.

F-71


Department of Water Resources
June 20, 1990
Page 2

The projected (less than 5%) increase in precipitation (p. 42) will be added to an already severely degraded EBNFFR watershed. The upper EBNFFR watershed exhibits all the negative indicators noted on p. 48 ("landslides, channel aggradation or degradation, and bank erosion") and, furthermore, has exhibited (as recently as 1986) the more severe indicators noted on that page (e.g., exponential runoff rates, massive increase in sediment load).

Although "natural annual variability in runoff masks any impacts that may be associated with cloud seeding", those impacts will take place.

I urge that DWR & USFS, as part of this prototype cloud seeding project, undertake a Cumulative Effects study on those areas of the EBNFFR within the extended project area and downstream.

Sincerely,


John Sheehan
Executive Director

JS/ljh

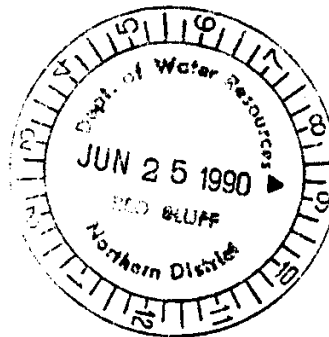
cc: Court Bennett
USFS
John Schramel
Bill Coates

Response to comments from Mr. John Sheehan, Plumas County
Community Development Commission:

The cumulative impact of snowpack augmentation in the extended area applies only if Alternative 1 is selected. Adverse impacts identified with this alternative have made it obvious that it is not a viable alternative and will not be adopted. Snowpack augmentation effects from Alternatives 2 and 3 do not impact beyond the Middle Fork Feather River drainage project area.

DEPARTMENT OF WATER RESOURCES

NORTHERN DISTRICT
2440 MAIN STREET
P. O. BOX 607
RED BLUFF 96080
(916) 527-6530



June 15, 1990

TO ALL INTERESTED PARTIES:

The comment period on the Plumas National Forest/Department of Water Resources joint EIS/EIR report concerning the prototype project to augment snowpack by cloud seeding using ground based dispersers in Plumas and Sierra Counties has been extended 14 days. Comments will now be received until the close of business on June 29, 1990. Comments are to be sent to the Department of Water Resources, 2440 Main Street, Red Bluff, California 96080, Attention: Dick Lallatin.

Richard D. Lallatin

Richard D. Lallatin
Program Manager

6-21-90

*We are totally against releasing
propane into our atmosphere.*

*We know water is ~~the~~ essential
to our survival, but we must
find other ways. Such as, Los
Angeles extracting the salt from
sea water, etc. Plus we feel*

(over)

you are "pulling the gun" not
having a complete impact
report - the Federal Government
hasn't given their approval.

you may agree to pay for
additional snow removal
expenses, but the area residents
have to actually get out & shovel
& drive in the extra hardship.
It really doesn't seem fair!

Sincerely

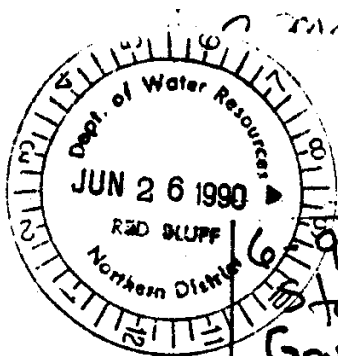
1. Ernestine Bond
2. Tony Pablos
3. Keith Sherman
4. Larry Bond

5050 Greenberry Dr
Sacramento, Cal.
95841

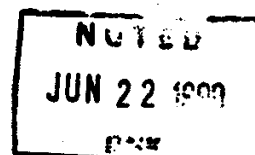


Response to comments from Ms. Ernestine Bond, Mr. Tony Gabalis,
Ms. Ruth Shusnan, and Mr. Larry Bond:

Water supplies are not sufficient to meet water needs in California every year. Water conservation and waste water re-use have been employed to stretch available water supplies. Desalination is more expensive than other methods of making water available for use. Precipitation augmentation is relatively inexpensive, and benefits both the local region experiencing drought as well as downstream water users.



6-9-90
State Capital
Governors office
Sacramento, California



Govenor Deukmejian

This is in reply to the 3 May'90 letter from the Department of Water Resources in those regards to cloud seeding. I have addressed the need for this office with them in a need for a 'Governors Drought Assistance Workshop' via the Public Utility Commission.

In regards though to: "Draft, Joint Environmental Impact Statement/Environmental Impact Report, Prototype Project to Augment Snowpack by Cloudseeding Using Ground based Dispensers Plumas and Sierra Counties, April 1990," p. 53 lists eight "endangered" species, their listing and current status. It is my opinion that in order to add emphasis to these "identified" eight endangered species then a list also of both plant & animal now extinct i.e. the California Brown Bear, Mountain Cow and the California Condor and etc. see ~~Control #~~ 447

Control # 818
7/10/90

JUN 27 1990

$\frac{2}{2}$

By this adding such a needed information to the final report would demonstrate a genuine concern for these "identified" eight endangered species.

Thank you for your Time

Albert G. Franklin

425 Chestnut Street #7

Redwood City, California 94063-2258

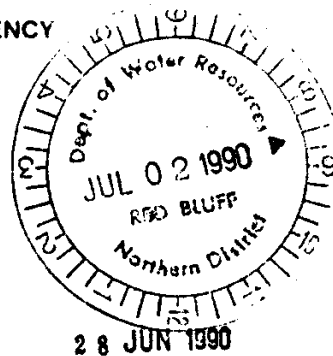
Response to comments from Mr. Albert Franklin:

Brown bears, mountain lions, and condors are not extinct. Both the State of California and the federal government have demonstrated genuine concern for all endangered plant and animal species. Laws have been created to identify, protect, and preserve such species.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IX
215 Fremont Street
San Francisco, CA 94105



Mr. R.D. Lallatin
Project Manager
California Department of Water Resources
P.O. Box 607
Red Bluff, CA 96080

Dear Mr. Lallatin:

The Environmental Protection Agency (EPA) has reviewed the Joint Environmental Impact Statement/Environmental Impact Report for the Prototype Project to Augment Snowpack by Cloudseeding Using Ground Based Dispensers, Plumas and Sierra Counties (DEIS). Our comments on the DEIS are provided pursuant to the National Environmental Policy Act (NEPA) and EPA's authority under section 309 of the Clean Air Act.

The DEIS identifies and analyzes alternatives for enhancing water yield by augmenting the snowpack in Plumas and Sierra counties. Snowpack would be augmented by the cloudseeding of winter storms by ground-based dispensers located on mountain tops in Plumas and Tahoe National Forests. The four alternatives evaluated in the DEIS are: (1) Ten Surface-Located Dispensers Using Silver Iodide (AgI) as the Seeding Agent; (2) Ten Surface-Located Dispensers Using Propane as the Seeding Agent; (3) One to Three Surface-Located Dispensers Using Propane as the Seeding Agent; and (4) No Project.


We have classified this DEIS as Category EC-2 (see enclosed "Summary of Rating Definitions and Follow-Up Action"). Our rating reflects the need for additional information in the DEIS regarding the potential effects of the seeding agents on air and water quality and on enhanced precipitation downwind from the seeding source. Our specific comments are enclosed.

We appreciate the opportunity to review this DEIS. Please send two copies of the Final Environmental Impact Statement (FEIS) to this office at the same time it is officially filed with our Washington, D.C., office. If you have any questions,

-2-

please contact me at (415) 556-6387, or have your staff contact Jeanne Dunn, Office of Federal Activities, at (415) 556-5104.

Sincerely,

A handwritten signature in cursive script, reading "Deanna Wieman".

Deanna Wieman, Director
Office of External Affairs

Enclosures

dcn: 90-239

cc: Court Bennett, USFS
Mountain Counties Air Basin
Central Valley Region (5), RWQCB

Air Quality

1. Section 176 of the Clean Air Act (42 U. S. C. 7506(c)) prohibits any federal agency from taking any action which does not conform to the State Implementation Plan (SIP). EPA considers that any action which would interfere with attainment or maintenance of National Ambient Air Quality Standards (NAAQS) or which would lead to violation of Prevention of Significant Deterioration (PSD) increments is prohibited.
2. According to page 26 of the DEIS, the release of hydrocarbons would produce photochemical reactions which would result in the formation of oxides of nitrogen and ozone. AgI would also be released in the form of aerosol particulates. The project area is located near two or three wilderness areas where Class I PSD increments are applicable and highly protective of air quality. PSD increments exist for total suspended particulates and oxides of nitrogen. The FEIS should discuss the NAAQS and PSD increments applicable to air quality in the project area. The Department of Water Resources and U.S. Forest Service should closely coordinate with the Mountain Counties Air Basin (MCAB) to ensure compliance with the MCAB portion of the State Implementation Plan.
3. The FEIS should indicate the amount and concentration of the acetone-AgI mixture that would be released and the rate at which it would be dispensed during storm events. The DEIS states that the concentrations of the silver and the iodide constituents are well below the standards set by the Department of Health Services (DEIS, page 26). The FEIS should indicate what these standards are for silver and iodide in air and identify any potential impacts, other than to NAAQS and PSD increments, that AgI and propane could have on air quality. The effects of subsequent fallout of these substances (e.g., on tree or soil in the immediate vicinity of the dispensers) should also be discussed.

Water Resources

1. A 1975 U.S. Bureau of Reclamation study reported the detection of a secondary zone of enhanced precipitation 90 to 125 miles downwind from the seeding source (DEIS, page 46). For each alternative, the FEIS should provide an estimate of the amount of precipitation that is expected to fall on the lee side of the Sierran crest and into watersheds other than the Feather River basin. The FEIS should also cite the evidence supporting the assumption (made on page 46 of the DEIS) that the proposed project would not have a measurable effect on the depletion of the water vapor content of the air mass downwind of the seeding area.

2. A map of the locations of the precipitation gauges should be included in Appendix C of the FEIS.

Water Quality

1. The FEIS should indicate whether the AgI or propane seeding agents would reach surface or ground water in detectable concentrations and how these substances could affect water quality. The FEIS should also discuss any toxic or otherwise deleterious effects that the seeding agents could have on water quality, vegetation, or wildlife habitat. Any cumulative impacts of the seeding agents on water quality should also be discussed.
2. The FEIS should describe the water quality monitoring activities that would be conducted during the project period and indicate whether project-related increases in erosion and sediment yield will be measured.

Environmental Impact of the Action

IO—Lack of Objections

The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

EC—Environmental Concerns

The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA would like to work with the lead agency to reduce these impacts.

EO—Environmental Objections

The EPA review has identified significant environmental impacts that must be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

EU—Environmentally Unsatisfactory

The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of environmental quality, public health or welfare. EPA intends to work with the lead agency to reduce these impacts. If the potential unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the Council on Environmental Quality (CEQ).

Adequacy of the Impact Statement

Category 1—Adequate

EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis or data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category 2—Insufficient Information

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS.

Category 3—Inadequate

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

*From: EPA Manual 1640, "Policy and Procedures^{Es84} for the Review of Federal Actions Impacting the Environment."

Response to comments from Ms. Deanna Wieman, U. S. Environmental Protection Agency:

The formulation of the proposed snowpack augmentation project has been closely coordinated with the California Air Resources Board and the Northern Sierra Air Quality Monitoring District to ensure the project would comply with the Mountain Counties Air Basin portion of the State Implementation Plan.

There are no areas internally or externally classified as required Class I Prevention of Significant Deterioration of air quality that will be impacted by this project. The closest is the Bucks Lake Wilderness Area, approximately 25 miles northwest, upwind and out of the paths of storm tracks that will be seeded by the project.

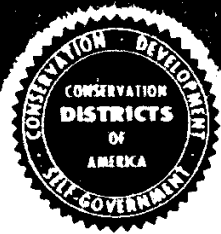
An extensive discussion of air quality has been incorporated into the Final EIS/EIR (pages 42 through 46). Silver iodide will not be used as a seeding agent for this project due to concerns about possible adverse effects. Propane undergoes photochemical oxidation to form water and oxides of nitrogen. No impacts in the immediate area of the dispensers or extended area are anticipated from use of the small amounts of propane due to dilution and mixing by the turbulent winds in the project area.

Table 1 (page 26) of the Final EIS/EIR provides background information on historical average precipitation at various locations in the project area. Total increased precipitation for the entire primary project area is expected to average less than 5 percent. The Final EIS/EIR cites a 9 year study by the U. S. Bureau of Reclamation, Division of Atmospheric Water Resource Management Group, of large scale effects of cloud seeding. No evidence was found to support the theory that stimulation of precipitation in one area deprived another area.

Locations of the precipitation gauges are shown in Figure 7 (page 20) of the Final EIS/EIR.

Silver iodide will not be used for the cloud seeding project. Use of propane is not expected to result in water quality deterioration due to the small quantity used and dilution by turbulent air movement in the project area. Propane is photochemically oxidized to form water and oxides of nitrogen. No adverse effects to water quality, vegetation, or wildlife habitat is expected from propane or oxidation products.

Water quality, erosion, and sediment yield will be monitored during the proposed project. These monitoring programs are being developed in cooperation with the U. S. Forest Service Plumas National Forest.



Indian-American Valleys Resource Conservation District

Quincy, California 95971

June 19, 1990

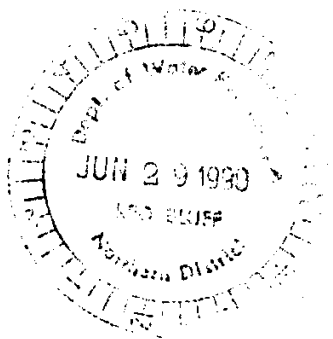
Department of Water Resources
Northern District
2440 Main Street
P.O. Box 607
Red Bluff, Ca. 96080

re: Cloud Seeding Environmental Review.

Dear Sirs:

The Indian-American Valleys Resource Conservation District (I-AVRCD) is concerned with the possible inter-related effects of cloud seeding on the lands within the I-AVRCD area. The I-AVRCD requests that a "Cumulative Effect" study be completed on the entire area of the I-AVRCD pertaining to the effects of cloud seeding.

Additionally, the I-AVRCD is disturbed with the effect cloud seeding would have on our Coordinated Resource Management Plan for the East Branch North Fork Feather River and our efforts to improve water quality and reduce erosion and sedimentation in the Feather River System.



Sincerely,

Jerry Spurlock
I-AVRCD Vice-Chairman

cc Leha Willis, Plumas Corp.
Mary Coulombe, USFS, Plumas Nat'l Forest
Dan Kaffer, USDA/SCS, E-87, Yuba City, CA

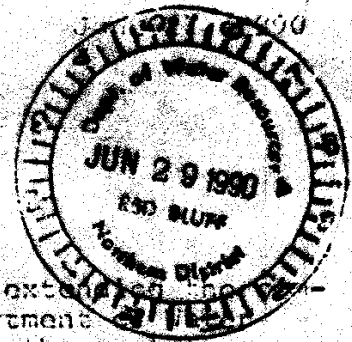
Response to comments from Mr. Jerry Spurlock, Indian-American
Valleys Resource Conservation District:

The Indian-American Valleys Resource Conservation District will be impacted by the snowpack augmentation plan only if Alternative 1 is selected. A number of adverse conditions associated with this alternative have made it obvious that it is not a viable alternative and will not be adopted.

Snowpack augmentation effects from Alternatives 2 and 3 do not impact beyond the Middle Fork Feather River drainage project area.

The Department of Water Resources and U. S. Forest Service are participating in the Coordinated Resource Management program for the East Branch North Fork Feather River and will continue to do so. If the snowpack augmentation program in the Feather River drainage is expanded following this proposed 5 year study, an environmental impact report will be prepared that will discuss cumulative impacts and their mitigation in detail. The Department of Water Resources would then have a more pronounced role and participation in efforts to protect water quality and reduce erosion and sedimentation.

California Department of Water Resources
Attention: R. D. Lallier, Project Manager
P.O. Box 307
Red Bluff, CA. 96003



Dear Mr. Lallier:

I am in receipt of your letter of June 15, 1990 extending the comment period on the Plumas National Forest/Department Resources joint Draft EIS/EIR report concerning the prototype project to augment snowpack by cloud seeding using ground based dispensers in Plumas and Sierra Counties. Although my name appears twice on the initial mailing list to receive copies of this Draft EIS/EIR for runoff enhancement in the Feather River, I did not receive one. I would appreciate your forwarding a copy at this time.

Please be advised I remain strongly opposed to this experimental cloud seeding project using ground based dispensers emitting liquid propane (C₃H₈).

While the Department of Water Resources (DWR) continues to add in their literature and other advisory hazards of this project they continue to overlook the fact that liquid propane is a highly flammable, volatile, vegetable oil based fuel. It is highly flammable and highly volatile. What has not been mentioned is that they are not dealing with another substance that will be burned from use in a few years (after the damage is done) and the fire adverse effects.

Should this project be implemented and it is as effective as claimed and projected; it is with total disregard of the residents of Plumas and Sierra Counties who live in lower lying areas who will be subjected to flood conditions as they have previously experienced. Furthermore, the additional runoff projected can only cause further erosion of the already eroded Middle Fork Feather River.

It remains against your responsibility in filling the reservoir to capacity with no regard to people, places or things while accomplishing this task.

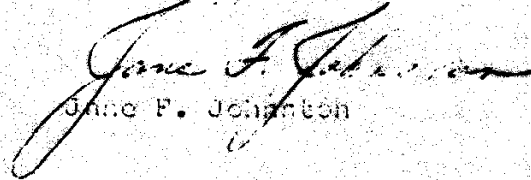
While your claims of projected information may be very impressive, your track record of adhering to same is very poor. For two years you have transported tanks and equipment thru Johnsville to and from the Plumas-Eureka Ski Bowl parking lot. To date, you have not complied with the prescribed safety precautions in doing so. Also, you have neglected stipulated precautions (i.e. fire fighting equipment) as while tanks are being filled with propane and transported. This is a violation of two significant workplans; I could enumerate further.

Until this experiment is proven to be safe, while it has not proven to be safe, it is an unsafe substance involved.

Page 2 of 2

(unarmed) is required to be on guard to be watchful in all aspects, and must be alert to respond and comply with rules and regulations of the institution. This project must be allowed to continue.

Sincerely,


Jane F. Johnston

Jane F. Johnston
P.O. Box 14
Blairden, C.A. 92 93

Response to comments from Ms. Jane Johnston:

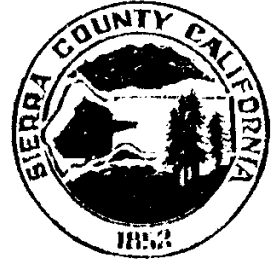
The Department of Water Resources and U. S. Forest Service did not select propane as a cloud seeding agent for snowpack augmentation without first checking with university scientists, public health officials, and air pollution experts as to possible adverse health and environmental effects. Their responses, though concerned, were all positive.

The project proponents have great concern for the residents of Plumas and Sierra Counties as well as all citizens of the State. It is not the intent to place any of them in danger through the activities of the snowpack augmentation project. The suspension criteria were designed to be operated to provide a great margin of safety.

The propane distributor, who delivers thousands of gallons of propane every year to local residences and businesses, handled the propane used in previous equipment testing in the project area. A fire fighting truck, equipment, and operator were stationed less than 1 $\frac{1}{2}$ miles from the propane tank filling site. Fire and hazardous material spill contingency plan will be filed following issuance of permits by the U. S. Forest Service Plumas National Forest.

SIERRA COUNTY

Department of Planning and Building Inspection
P.O. Box 530
Downieville, California 95936
916-289-3251



Tim H. Beals
Director

May 24, 1990

Mr. Dick Lallatin
Department of Water Resources
P. O. Box 607
Red Bluff, CA 96080

Dear Mr. Lallatin:

The County of Sierra would like to request a two (2) week extension of the June 15, 1990 response date for comments on the Draft Joint Environmental Impact Statement/Environmental Impact Report (DEIS/EIR) for the Prototype Cloudseeding project.

The Planning Commission has expressed a desire to forward the Board of Supervisors comments on the DEIS/EIR for them to incorporate in the County's formal response. Due to the timing and the infrequency of the Planning Commission meetings, it would be difficult for the full Commission to prepare and approve their comments for the Board to subsequently consider and incorporate in the County response prior to the June 15, 1990 deadline.

We hope you will approve this request so that the County of Sierra may provide you with carefully developed comments which will enhance the environmental assessment of the proposed project. If a two (2) week extension will create complications in your time frame, the County would appreciate and accept a shorter extension.

Thank you for your consideration.

Sincerely,

SIERRA COUNTY
PLANNING DEPARTMENT

Julie Griffith
Planner

JG:jc:5/33
cc: R.C. Bennett, Forest Planner

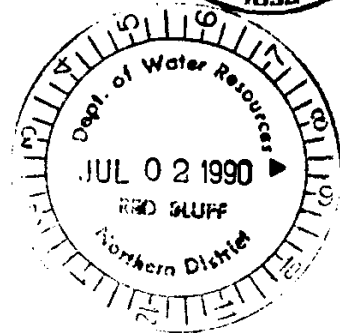
SIERRA COUNTY

Board of Supervisors
P.O. Drawer D
Downieville, California 95936
916-289-3295



June 22, 1990

State of California
Department of Water Resources
2440 Main Street
Red Bluff, California 96080



Attn: Mr. Richard D. Lallatin
Program Manager

Dear Mr. Lallatin:

Please consider the following comments regarding the publication of the U.S. Forest Service - Plumas National Forest and State of California - Department of Water Resources entitled Draft Joint Environmental Impact Statement/Environmental Impact Report - Prototype Project to Augment Snowpack by Cloudseeding Using Ground Based Dispensers - Plumas and Sierra Counties dated April 1990.

The Sierra County Planning Commission on June 12, 1990 and the Sierra County Board of Supervisors on June 19, 1990 reviewed the document and the following comments represent the position of Sierra County with respect to the environmental process and content of the joint publication:

1. The document generally contains far too much opinion and unsubstantiated conclusions. The technical information supporting conclusions needs to be included otherwise many conclusions stated can only be considered arbitrary. This includes conclusions reached with respect to erosion, channel capacities, flood, effects of propane, water quality, cumulative effects, etc.
2. There is nothing within this document that describes the effect of seeding clouds over the lakes basin region as they pass to the east and the resultant shadow which can be expected. This shadow would result in less precipitation to those areas east of your target areas (Sierraville, Portola, Loyalton and east into the Great Basin region). These areas are arid experiencing less than ten (10) inches of precipitation annually and we strongly oppose as well as express concern over this potential effect and the complete lack of analysis within the document.

Donald M. McIntosh
District No. 1
P.O. Box 504
Downieville, CA 95936

Nevada "Babe" Lewis
District No. 2
P.O. Box 35
Sierraville, CA 96125

Perry McCaffrey
District No. 3
P.O. Box 5
Sierraville, CA 96126

Donald E. Bowling
District No. 4
P.O. Box 282
Loyalton, CA 96118

S. Craig McHenry
District No. 5
P.O. Box 750
Loyalton, CA 96118

Mr. Richard D. Lallatin
June 22, 1990
Page Two

3. The discussion of cumulative effects is inadequate. Conclusions are reached indicating "no discernable direct impact" and no information exists to support this conclusion. The U.S. Forest Service at this very time has exceeded its threshold of cumulative effects from all of the proposed timber sales (green and insect sales) and a statement and conclusion indicating no effect is improper and incorrect.
4. Page 57 provides a conclusion that the project does not conflict with Sierra County Zoning and General Plan language. This is not true and conversely, past propane dispensing units have been in violation of Sierra County zoning regulations. The role of Sierra County and this potential land use conflict needs to be addressed.
5. The document does not look at economic impacts to the local area and to the region. Further, this document needs a complete and clear cost/benefit analysis which clearly represents who benefits and who stands the cost. This is a requirement before any objective decision may be made.
6. This document and the program of cloud seeding does not analyze the propose dispensing concept in concert with all other weather modification programs, experiments and such in existence. This has certain cumulative impacts.
7. The discussion on alternatives is inadequate. Other than a no-project alternative, all others express some variation of cloud seeding-weather modification. This "restrictive" analysis presents an indication that the lead agencies have developed a psychological momentum that some form of modification must occur. Other "reasonable" alternatives exist and must be included.
8. Sierra County asserts "County of Origin" rights as the primary watershed originates in the Sierra and Plumas County region. Compensation must be analyzed for both counties if the lead agencies propose to create and capture water originating in Sierra or Plumas Counties and transport it through the Statewide water transport system. The document should identify and discuss this county of origin legislation.

This concludes the comments with respect to the environmental process and the specific content of the draft environmental document. This letter is not intended to establish a position in favor of nor in opposition to weather modification or cloud seeding. It is intended only to be a position on the draft environmental document.

Mr. Richard D. Lallatin
June 22, 1990
Page Three

Thank you for the opportunity to comment and we will look forward to your response.

Sincerely,



Tim H. Beals
Planning Director for

Jerry McCaffrey, Chairman
Board of Supervisors

THB:JM:jc:6/32

cc: Members of the Board of Supervisors
Members of the Planning Commission
County Counsel
Clerk of the Board
Planning Director
U.S. Forest Service - Plumas Forest Supervisor
Plumas County Board of Supervisors

Response to comments from Mr. Tim Beals, Planning Director, Sierra County:

Technical information was included when it was available or was referenced for substantiation.

The primary precipitation area description on pages 2 and 3 describes the limits of influence downwind from the 10 dispenser locations and lists the communities that will be affected. Sierra Valley, Sierraville, and Loyalton are out of the area of influence from the storm's track crossing the 10 dispenser sites and will continue receiving normal precipitation. A discussion on downwind precipitation depletion is presented on page 50 and 51 of the report.

The discussion on potential cumulative effects on erosion, beginning on page 51, points out that no estimate was made as the effects of additional runoff due to an augmented snowpack cannot be assessed independent of other human-related land use or natural occurrences. The Department has agreed, in cooperation with PNF, to establish a monitoring program in the primary target area to determine effects of the proposed project on water quality, erosion, and sedimentation.

Both Plumas and Sierra Counties have adopted a General Plan incorporating all of the elements required by Government Code Section 65300, et al. Any proposed land use within the counties must be compared with this General Plan to determine if the proposed use is consistent with the basic land use designation and does not adversely affect an overlying constraint. The EIS/EIR document discusses the effects the project will have on the appropriate elements. Those elements affected are portions of: (1) scenic areas, (2) noise, (3) safety, and (4) conservation. The report concludes there will be no significant impact on any of the elements that cannot be mitigated. The State is not subject to complying with requirements for use permits issued by the County. However, to assure the County that the State is willing to comply

to their General Plan element requirements, as far as is reasonable, and to keep the County fully informed as to the Department's activities within their jurisdiction, the Department will supply to the County all the information required on the use permit application forms. The Department will also reimburse the counties for their review and filing of the information. In doing so, the Department is not waiving any immunities it may have as a matter of law of not consenting to any local jurisdiction beyond that required by law.

The introduction for the report states that the project is a 5-year study and will provide the information needed to determine if it is possible and feasible to augment the water content of the snowpack using cloud seeding methods. A realistic verification for a future project then can be made of benefits and operating costs. If this project demonstrates that snowpack augmentation is economically viable, it could lead to an expanded program, which is a decision that neither the Department or U. S. Forest Service have yet approved or funded. If the program is expanded to other areas, an environmental impact report then would be prepared that would address a cost/benefit analysis. Local effects of the project have been examined and the Department has agreed to reimburse local area governments for any increased cost of snow removal associated with the proposed project.

Presently, Pacific Gas and Electric Company in the North Fork of the Feather River drainage is the only other snowpack augmentation program adjacent or near this proposed project area. This proposed project has been coordinated with PG&E and one of the results is that an area of the Feather River Basin will not be seeded by either agency, but will be retained to provide base-line data for precipitation under natural conditions. The project proponents are aware of other cloud-seeding efforts going on in the State, but they are remote from the Feather River drainage and will exert no influence in this area.

The introduction of the EIS/EIR discusses water supplies from

existing reservoirs and ground water basins, water conservation, waste water re-use, water transfers, ground water recharge, and weather modification as alternatives to increase water supplies. While other alternatives are actively being pursued, this document was prepared in order to pursue the possibility of weather modification. Other weather modification alternatives were considered and discussed but were eliminated (see page 9).

Sierra County asserted that it has "county of origin" rights because the primary watershed originates in Sierra and Plumas Counties and that compensation for the counties must be analyzed as a result. The relevant area of origin laws do not give the counties a right to compensation for water supplies developed within the counties or for water supplies that originate as precipitation in their counties. The County of Origin Law, Water Code Section 10505, provides that the State Water Resources Control Board shall not approve a priority in appropriation of water under a State filing that would deprive the county in which the water originates of any water necessary for the development of the county. This means that if a project appropriates water under a State filing within the county for delivery for use outside the county, the project will be subject to having other appropriations made later with a higher priority if they would provide water necessary for development of the county. The Watershed of Origin Law, Water Code Section 11460-11465, provides that the water rights of the Department of Water Resources are subject to being diminished by later water developments that would serve beneficial uses in the watershed where the water originates or in immediately adjacent areas. Alternatively people in the watershed of origin or the immediately adjacent areas could purchase water from the State Water Project with a priority higher than water contractors outside the watershed of origin. The purpose of both laws is to allow water projects to be developed in the local area to serve local needs, despite the existence of projects developed earlier by the State in that area to supply water needs in other areas. Neither law contemplates payments to the counties for the water.

